An Analytical and Empirical Comparison of Electronic and Mobile Health Platforms

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ABSTRACT

Electronic and mobile health (EMH) is a new way of delivering health services to patients with the use of small portable devices like mobile phones or tablets. The term electronic indicates that doctors and medical personnel use electronic health records or electronic prescribing of medicine for patients. Some countries like Slovenia, use electronic prescriptions of medicine for many years now. According to World Health Organization (WHO), mHealth has the ability to transform the delivery of health services all over the world and bring about a paradigm shift in healthcare delivery processes [6]. By using technological innovations we can overall improve healthcare not only in developed countries but also in countries that are still in the developing phase. In these countries, there is a lack of doctors, so optimizing the process of delivering medicine and information to the patients is very desirable. In this paper, we describe some of the EMH online available platforms and compare them with the one which we developed within the ISE-EMH project.

KEYWORDS

mHealth, eHealth, electronic and mobile health, EMH, comparison of EMH platforms, ISE-EMH

1 INTRODUCTION

From the early beginning of the web when there was only limited information about key institutions, e.g., universities, libraries, and organizations, available on the web and till this day where we can find practically anything including illegal organizations and activities, the public need platforms or portals which will aggregate all useful information on one central place. While anything can be found on the web, it is often difficult to find proper and useful information [9].

To overcome the issues of disinformation especially in the field of medicine and products for the elderly, as part of the ISE-EMH project we implemented a unified EMH platform together with an application for smart hardware devices. We described the application for smart devices in [9]. The EMH platform is a central entity where the user can find key information about health and elderly, and where he can converse with other patients and doctors via text- or video-based call centers, or exchange information, e.g., x-ray images or photographs of the patient skin. We analytically and empirically compare the existing EMH platforms with each other to learn more about the pros and cons, and to improve the ISE-EMH platform in the future.

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The rest of the paper is organized as follows: In Section 2, we describe existing platforms. Section 3 presents the ISE-EMH platform, The results of analytical and empirical comparison of the platforms are given in Sections 4–5. Finally, Section 6 summarizes the paper with ideas for future work.

2 AN OVERVIEW OF EXISTING EMH PLATFORMS

2.1 Genoa

Genoa is a platform that offers telepsychiatry services [5]. It is, for now, available only in the United States. It connects people (patient-doctor) through a system of video-conference technology. Telepsychiatry is a branch of telemedicine where they only provide help for psychiatric and mental disorders.

2.2 DigiGone

DigiGone is a packet of services, including a medical one called DigiMed [2]. Their philosophy is like that of Genoa. However, they offer general medical services, not only for psychiatric problems. For example, when applying as a patient, you get a technical kit. When you have an appointment with a doctor, your nurse or caregiver comes to your home and examines you, and via video conference tells the information to a doctor. In this kit, you have also an ultrasound device, so it can stream the data to the doctor in real-time.

2.3 Doxy.me

Doxy.me is a free telemedicine service, implemented as a web application, thus no installation is needed. It is also accessible from various devices. All you need is a microphone and a web camera. All the data is encrypted and also no account is needed, in contrast to many other platforms [3].

2.4 eVisit

eVisit is a telehealth service that is not free of charge. For the doctors and patients it offers virtual flexible scheduling [4]. For doctors it provides a list of medications for prescription to patients, which is a very convenient and helpful feature that saves time. Other platform services are similar to the already described ones in other telemedicine platforms.

2.5 iPath

iPath is the oldest telemedicine platform from the early beginning of the development of protocols for the internet. iPath is a case-based collaboration platform that is used in telemedicine applications to share information within a distributed group of people. It is being used in the domains of consultation, teaching and research [8]. It is also multilingual like the ISE-EMH platform.

2.6 MedSymphony

The MedSymphony platform is build for telemedicine electronic and mobile health, MedSymphony is directed to accelerate the use of telemedicine as a key platform for providing health care. The key feature is to provide better health care for millions of patients anywhere and anytime. MedSymphony was created to qualify doctors, medical personnel, caretakers and health institutions as well as patients with a complete electronic and mobile health technology platform. The platform includes everything you need to establish a video-based doctor's office. – a completely cloud-based compliant solution with integrated video conferencing, online prescription ordering joined with SMS, MMS, and email integration to facilitate the doctor-patient relationship, and automated billing for recurring and one-time fees [10].

2.7 Bodi Zdrav

Bodi Zdrav (in English "Be Healthy") is a Slovenian health-related platform [1] and it is only meant for patients in Slovenia. Its purpose is to give information about the services and to connect the patients and doctors. It only offers services that are not officially recognized in medicine, e.g., homeopathy, bio-resonance, hypnotherapy, etc. Its main content is a search function through regions in Slovenia and filtering of services from specific medical branch.

2.8 EcoSmart

The EcoSmart project was a three-year project that included the participation of 26 partners. It included smart cities as well as eHealth and mHealth domains. Within the project, an electronic and mobile health system was developed. The purpose of the system was to provide key information about the project partners and municipalities in Slovenia, as well as health domains and prototypes. It also included a smart bot for which the main task was to answer questions to users.

3 THE ISE-EMH PLATFORM

3.1 Basic Information

The ISE-EMH platform is being developed within an Interreg Italy-Slovenia project, where the final goal is to develop a unified telemedicine (EMH) platform for both Slovenian and Italian public and private institutions, with the aim of accelerating the cooperation between Italian and Slovenian stakeholders and transfer knowledge from academic field into practice. The platform includes new diagnostic approaches, advanced sensors, including devices that monitor vital signs, and also methods of Artificial Intelligence (AI) that will help patients overcome anxiety, depression and sedate stress. By connecting various stakeholders, the platform also aims at overcoming the main problem of EMH that is the lack of transfer of innovative services from laboratories into practice, due to the lack of support services in terms of both ICT systems and human partners, and their integration [9].

3.2 Detailed Description of the ISE-EMH Platform

The purpose of the ISE-EMH is to connect different partners, medical personnel, doctors, patients, and end-users. This is done through different logic and programmatic mechanisms. The platform uses the Rocketchat text-based communication system to enable users, e.g., patients to send questions to doctors. Also, the patients can converse with each other in the public channels, where they can exchange thoughts / opinions about their diagnosis, disease or condition. Also, the platform includes a virtual assistant (bot) and connects it with the Rocketchat system. The purpose of bot is to answer questions about medicine, partners, waiting queues, and similar. This is helpful when no doctor is available. There is also an advanced search mechanism, implemented with the versatile, fast, and efficient Elasticsearch.

The ISE-EMH platform development will result in an EMH ecosystem that will include/provide [7]:

- A platform that connects products and services, i.e., the backbone of the ecosystem;
- Integration and connection of existing products, services, and systems through the platform in a complete ecosystem.

4 ANALYTICAL COMPARISON

The described platforms were compared with respect to a set of selected features (see Section 4.1). The comparison was performed analytically and empirically, where the results of the former evaluation are presented in Section 4.2 and the results of the latter one are given in Section 5.

4.1 Choosing the Features for Comparison

The set of features for the platform comparison consists of carefully selected features, selected based on the state-of-the-art research in the EMH domain. Demographic and social characteristics were also carefully taken into account, e.g., if it is free of charge for using it and if it is available in more than one language. We also included some of the other key features which are important for user experience, e.g., if it has a GUI and if it is responsive or not. The selected features are the following:

- Free: Is the EMH platform free of charge to use it?
- Graphical user interface: Does it have a GUI or is it just text-based?
- Dynamic data: Can we insert new data and update the fields via a form?
- Responsive: Is the web platform responsive, which means, does it automatically resize the website when viewing on the different devices?
- Virtual assistant: Does the platform offer the chance to talk with a bot, e.g., about medicine, diagnosis, partners, etc.?
- Use without registration: Can we use the EMH platform without registration?
- Multilingual: Is the EMH platform available in more than one language?
- Official medicine: Does the EMH platform offer services to the people from only official (recognized) medicine?
- Call center: Does the EMH platform offer call centers (text-based or video-based) for getting help?
- General medicine: Does it offer services from different medicine practices or only one?

4.2 Results of the Analytical Comparison

The results of the analytical comparison of platforms are shown in Table 1. Based on these results we constructed a histogram of features, where each bar presents the percentage of included features in a specific EMH platform (see Figure 1). This histogram shows that the worst platforms with respect to the chosen features are Genoa and BodiZdrav.

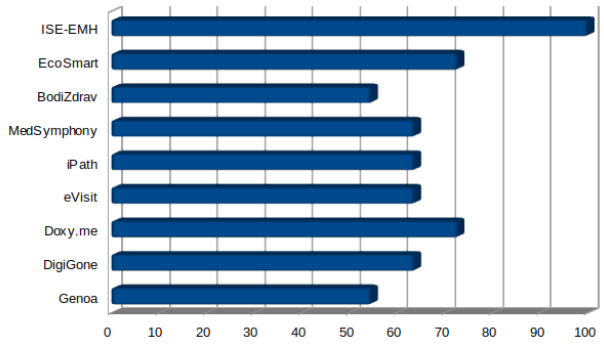

Figure 1: A histogram of platform feature percentages, where each bar represents the percentage of checkmarks from Table 1.

For Genoa the cons are that it is not free, it does not have a virtual assistant, e.g., a bot that can answer your question at any time of the day, you cannot use it without registration, it is not multilingual, and also the usage is limited to only psychiatric conditions, since they are specialized only in telepsychiatry.

For BodiZdrav the cons are that it does not have a virtual assistant, it is only available in the Slovenian language, the services which they offer are not from officially recognized medicine, it does not have call centers, and also they do not have services from general medicine but only alternative medicine.

The most versatile and useful system based on the selected features is the ISE-EMH platform.

5 EMPIRICAL COMPARISON OF SIMPLY ACCESSIBLE PLATFORMS

Among the evaluated platforms, the ones that are simply accessible, i.e., they do not require to create an account to use them, were further analysed. This analysis was empirical, from the user perspective usage, and it also included side features such as user story. Based on the simply accessible criterion, three systems were empirically analysed: Bodi Zdrav, EcoSmart and ISE-EMH.

5.1 Bodi Zdrav User Experience

The Bodi Zdrav platform has a good graphical user interface design. When the user visits the page, it has only one component on the landing page, i.e., a search. The user can select a category and a region, which act as filters for search. As already mentioned, it does not have a virtual assistant nor call centers (see Figure 2).

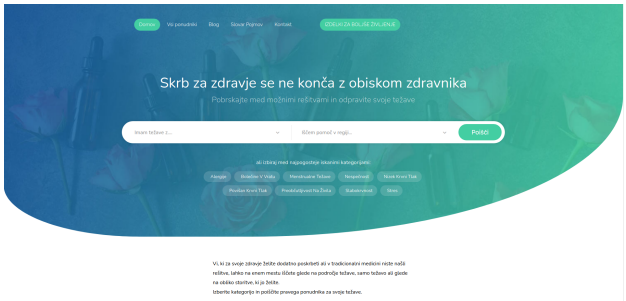

Figure 2: Bodi Zdrav Homepage.

5.2 EcoSmart User Experience

The EcoSmart platform has a simple and sleek graphical user interface design. When the user first visits the page it has ten categories on the landing page. It does not provide a search tool, but it has a link to the EcoSmart bot and other bots on the page (see Figure 3).

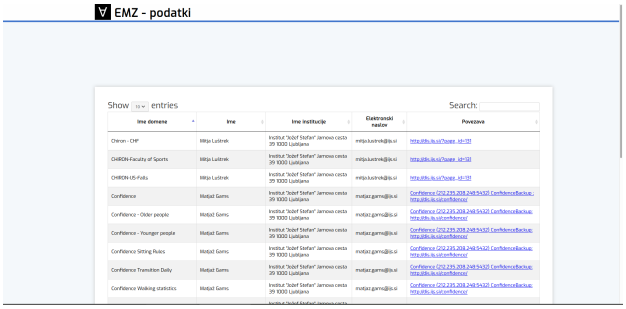

Figure 3: EcoSmart Homepage.

5.3 ISE-EMH User Experience

The ISE-EMH platform has an original graphical user interface design. A user visiting the page for the first time has all the components on the landing page (see Figure 4). These components are a virtual assistant, services, search tool, and button for changing the language. This is very crucial when users need to find specific information fast. The user interface is constructed and designed in such a way that every person no matter the age can use the platform.

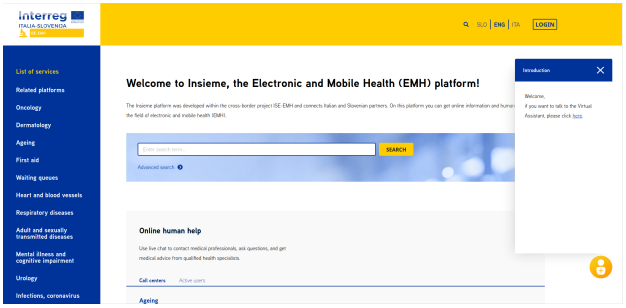

Figure 4: ISE-EMH Homepage.

6 CONCLUSION

In this paper, we described and compared a set of most important EMH platforms that are available on the web. Also, we presented the developed ISE-EMH platform. We also analytically compared these platforms based on a selected set of key features. In addition, a subset of platforms was empirically compared by focusing on a user's point of view. This analysis shows that the best-rated platform is the ISE-EMH platform.

In our future work, we will test our hypothesis stating that a user can find specific information about health-related topics on the ISE-EMH platform in under 30 seconds, instead of searching for more than 30 minutes on other platforms or through the search engine like Google or Bing. We will conduct the experiment with the help of volunteers, where they will try to find 10 randomly selected services on the ISE-EMH platform and also using a general search engine.

	Genoa	DigiGone	Doxy.me	eVisit	iPath	MedSymphony	BodiZdrav	EcoSmart	Insieme
Free	✗	✗	✓	✗	✓	✗	✓	✓	✓
User-friendly	✓	✓	✓	✓	✗	✓	✓	✓	✓
Graphical user interface	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dynamic data	✓	✓	✓	✓	✓	✓	✓	✗	✓
Responsive	✓	✓	✓	✓	✗	✓	✓	✓	✓
Virtual assistant	✗	✗	✗	✗	✗	✗	✗	✓	✓
Use without registration	✗	✗	✗	✗	✓	✗	✓	✓	✓
Multilingual	✗	✗	✗	✗	✓	✗	✗	✗	✓
Official medicine	✓	✓	✓	✓	✓	✓	✗	✓	✓
Call center	✓	✓	✓	✓	✗	✓	✗	✗	✓
General medicine	✗	✓	✓	✓	✓	✓	✗	✓	✓

Table 1: Comparison between the analysed EMH platforms.

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