Comparative study of “functional” mobile applications

(Invited Paper)

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Abstract—the paper compares the findings coming from three case studies for the case of mobile data services and highlights factors that could explain the low usage rates among the users. The movement of applications from desktop platforms to wireless and mobile configurations may have a significant impact on future daily activities. Mobile computing supported by broadband wireless networks allows users to have information and communication when they are on the move offering rich mobile applications and services. But the low diffusion of mobile applications and services in European societies asks for more investigation in order to explain users’ behavior within mobile networked environments. The results presented here tend to suggest that the functionality of the applications itself is not an adequate factor that could increase the usage rates.

Index Terms—Mobile applications, usage, mobile information systems, mobile-health systems.

I. INTRODUCTION

The rapid developments in processing technologies and wireless technologies allow pervasiveness and mobility introducing new environments which are called ubiquitous information environments promoting the arrival of the Ubiquitous Information Society [1]. The convergence of technologies has produced advanced multipurpose handheld devices called smart-phones [2], [3], which together with new promising software platforms such as, [4], [5] and others, promise to provide more functional mobile applications.

New systems, meanings and disciplines have been arisen by the use of mobile devices within the whole spectrum of the social environment. For example within the discipline of health the pervasive healthcare systems have been developed. These systems involve the sensing of a patient’s physiological and physical parameters anywhere anytime and transmitting them via mobile phones to a remote medical center, where expert medical knowledge resides [6], [7] and access through mobile devices to medical data base. The evolution on advanced algorithms, high performance mobile phones, sensors, monitoring devices, and telecommunication networks made feasibly the provision of good quality of medical care to mobile users, the information exchange, and the distribution of medical knowledge among health care professionals [8].

These systems also promise to provide a true mobile rich web browsing experience making the user interface richer, allowing information rich services as location-based services, streaming services as Mobile-TV and others.

Furthermore these new smart-phones and new platforms could integrate Web 2.0 services [9], in a mobile device leading to the development and evolution of web-based social applications such as social-networking sites [10] and blogs [11], to mention but a few. Mobile platforms [12] can support the architecture, which enables the interactive and democratic organizing of the contents by users on the move allowing mobile users to easily add contents and participate in the online community realizing the idea of ubiquitous computing environments [13].

But today the limited number of success stories as SMS, imode in Japan., ring tones and wallpapers as well as the failure of Wireless Application Protocol (WAP), the disappointing results of imode in Europe, the low diffusion and low willingness to use mobile data services in western societies [14], reveal that the mobile data services and thus the mobile phones as ubiquitous tools are not desirable enough for the users. Even in the last couple of years where the mobile phone penetration rates in Europe [15] reached 100% and although the development of new advanced smart-phones promises increase in mobile services usage rates the basic services such as SMS, ring tones, icons and logos are still the most popular services [16].

Although the development of mobile services has been intense for years, the adoption of new mobile services it has been much slower than expected, especially in Western Europe [17], [18].

These disappointing results of mobile data services adoption and use, make scholars [19], question the understanding of the adoption and usage behavior within these new environments, make them investigate the factors that affect usage behavior [20] and make technologists [21] to admit the absence of recognizably advanced mobile applications and effective support for information rendering on small screens [22]. Although other scholars [23], [24] have used the complexity of the transactions, the miniaturization of the screen and keyboard, the perception of lack of security and lack of user friendly mobile portals to explain why mobile
commerce and mobile payment have not performed as expected this paper argues that the functional characteristics of mobile applications cannot explain why the mobile data services are still unsuccessful.

The rest of the paper is organized as follows: Section II delineates the methods and approaches used to collect the data, describing the case studies used. Section III, presents the collected data and discusses the findings. Finally, in Section IV, the overall conclusions of the presented study are discussed.

II. METHODS AND APPROACHES

The data that presented here comes by active participating of the author in a study of a commercial mobile data services platform (Service A - a pseudonym) and in a two running R&D projects in the area of e-health. The units of analysis are end users and the data collected concern both technological and social issues and will be presented in the form of case, multiple unit of analysis type case studies [25]. These three case studies have collected enormous data from a variety of sources applying a variety of research and data collection methods.

A. Case Introduction: Service A

This case study explores the role of place for the case of mobile data services usage behavior and it was conducted by the author in cooperation with two other researchers in UK and Australia. The theoretical framework that was adopted to capture this role, was based on the articulation, simplification and modeling of place using Tuan’s four dimensions [26] accompanied by the factors and attributes coming form the Brahms modeling language [27].

Service A, has been chosen for this research because as a brand mobile services platform it has extent awareness within the Greek population, offers a pool of different success services and allowed the establishment of samples across diverse groups of users. Service A has been considered by the press as an innovative service compared with the competition. Service A is a portal that allows users to have WAP services as well as to surf the Internet and have Mobile Banking, maps, On-line shopping, travel/booking, and other applications on their mobile phones. Service A is considered by the press as a world wide success story providing among other things successful mobile applications such as e-mail and MSN over mobile phones. These applications were used as a data collection tool during the field study as a means of “synchronous feedback”. In this paper we present and discuss the findings that concern the applications that provide information services to the users.

Qualitative research methods were used and the data collection for the research was carried out using interviews, focus groups and observation method where information collected related to the way users interact with the place in real usage situations. Furthermore, elements of Contextual Inquiry method [28] were used, in conjunction with more novel methods such as mobile Probes [29], [30]. A data collection technique was applied which augments the feedback method allowing the user and the researcher to be always in contact having synchronous textual communication [31].

B. Cases Introduction: R&D e-health projects

On the present document lie information and feedback collected from the participation in international telemedicine research projects [32] and [33] evolving around the provision of healthcare services to remote and isolated areas, addressing the needs of different target groups among which were remote and mobile users. In the realm of these two projects an integrated broadband telecommunication platform has been developed. The platform, which is able to cover a wide range of the aforementioned services, can be used to:

- Enable the home tele-monitoring of “at risk” citizens, e.g. elderly, patients with chronic diseases, and post-surgery patients.
- Handle emergency cases in rural health centers, ambulances and/or ships.

Through the platform is possible the efficient handling of patients with chronic diseases, the early response to emergency incidents, and the reduction of human lives losses.

The platform and the provided services will be assessed by citizens, travelers, patients, crew members, and physicians in the aforesaid sites.

For the home care telemedicine services two different systems have been used. These two patient-monitoring peripheral units include a multifunctional wearable wireless device and a wearable wireless 3 lead ECG produced by European makers that are partners in the project [34], [35]. More specifically the WristClinic™ [36] is a fully wireless, multi-parameter medical monitor that is worn on the wrist being activated by the patient at pre-set times. The monitoring device performs five (5) tests named Blood Pressure test, 1 lead ECG test, SpO2 test, SpO2 and Breath test and Temperature measurement test while the wireless ECG miniature sensor performs 3 lead ECG tests. Vital signs are measured, and data are transmitted wirelessly to a Symbian S60 or windows mobile 6 Mobile phone, Bluetooth enabled, that can forward the data Internet (Wi-Fi) or wireless GSM/GPRS networks to the data base installed in National Center of Scientific Research “Demokritos” premises that is accessible via web.

The users that have been supplied with the appropriate wearable monitoring device(s) are individuals with chronic cardiovascular diseases who are in risk of an incident stroke/already had a stroke (ECG monitoring), hypertensive and individuals with chronic obstructive pulmonary disease (COPD).

The case scenario of this service consisted of patients that need of continuous monitoring as a chronic patient or someone who is suffering from tachyarrhythmia (a medical situation that can be developed to an emergency case if not treated properly). In this scenario, the patient’s collect some vital measurements can be developed to an emergency case if not treated properly. This scenario is focused in supporting and monitoring of patients with chronic diseases living at their houses from specialized doctors interconnected through diverse broadband networks, avoiding the routine transitions from and to the hospitals, a process which is very tedious for residents in rural areas.
where the service was offered. We used a semi-structured interview guide addressing evaluation of the services offered, positive and negative experiences of usage and recommendations.

This combined approach revealed areas of potential interests to m-health which are not fully covered yet by scholars e.g. the effect of operational context on health care delivery.

III. RESULTS AND DISCUSSIONS

Within this paper I am studying the new generation of mobile applications provided by smart mobile phones, which integrate various functionalities, such as camera, internet browser, Wifi and Bluetooth receivers, videoconference applications and others. Following [37], who studied the impact of mobile phones adopted for functional, work-related reasons (e.g. availability, flexibility), on the users' everyday life activities this paper is focusing on mobile applications and services that provide functional benefits to their users in everyday contexts.

The first case study of Service A investigated the use of the information services of a well known mobile data service platform. There was strong evidence [38], to support the premise that the built environment impacts behavior of users of mobile data services and that users' basic situational responses are predictably to the environmental conditions. Thus users require secure spaces to use mobile data services. For that there are fewer options of “suitable” spaces to use mobile data services than just to have a call or to text. I argue that space matters and limits the options people have to use mobile data services. We have also to take into account that service A is a unidirectional service meaning that users have to initiate by themselves the access of mobile data services. Calling and texting on the other hand are bi-directional services since call and sms could be received when someone is everywhere as on the street or on public transport. Based on the above I argue that space plays crucial role in the usage of mobile data services since it influences the decision to initiate a mobile data service. Following is a conceptualization of the role of space in the usage decision.

The findings coming from the R&D projects indicate that the broad adoption and use of mobile health services is still lacking although the functionality and ease of use of the monitoring devices and the mobile health applications that are installed into specific smart phone devices are getting better and better. Have to mention that although the mobile health applications are socio-technical entities within increased responsibilities for the involved stakeholders (end users, m-health services provider, doctors and relatives) the users perceive them as services that provide to them functional benefits.

An interesting point that came out from the usage research is that among most of the users that belong in the target group of the mobile health applications it is observed an unexpected drop in mobile data services usage. The users that participated...
in the projects were asked by their doctors to take measurements daily for a specified time period of two months. The users were informed that that they could use the e-health services for the validation period and for a period of four months after the validation period for free. The usage rates as registered in the data base revealed that for the first two to three weeks the users conformed to the specified medical protocol and were taken their measurements daily. But after that period the measurements started to gradually reduced.

The users justified this attitude claiming that there are time periods where they are very busy, feel well and thus forget their health problem. These time periods they usually forget unconsciously to monitor their health status using the monitoring devices. Have to mention that after the determined period of the two months where they asked to keep monitoring their health status the majority of the users either abandoned the use of the monitoring devices or limited the measurements to once per week.

According to the findings this attitude can be explained by the fact that the users don’t perceive immediate the benefits of the mobile health applications since these services provide preventive medicine and not curing their illness as happening with their pills.

Also enough users, mainly the older ones, don’t feel comfortable with technology. The systems we used in the projects were based on smart phones (windows mobile 6 phones and Nokia N95). Most of the users didn’t know how to take into use most of the applications these mobile phones provided and they didn’t have the motivation to try to learn more than the necessary applications that they be asked to use. This characteristic made the users to perceive the smart phones as systems technologically advanced making them feel anxiety as they admitted.

This fact differentiates the adoption of the mobile health service from the actual usage behavior. The users easily adopted and kept the systems in house, since they found the service of constantly monitoring as something helpful and necessary. But that belief doesn’t mean that the users heavily and constantly use the mobile applications making use of the wireless network.

The findings revealed that the environmental situations and the attitude of the users against technology made them most of the time to be consciously or unconsciously, unwilling to use such applications. Have to mention that the decision of the users to use such applications is a most important factor since the above functional applications are unidirectional services, meaning that users have to initiate their use by themselves. This is not the case for calling and texting which are bi-directional services since call and sms could be received when someone is everywhere as on the street or on public transport etc.

These findings made me conclude that the real problem with mobile data services and applications is not the adoption process per se but the fact that the users who own such services and applications seldom use them.

Following the above findings we clustered the mobile applications between emotional and functional layers (Figure 2).

According to the findings users are prone to appreciate the functional offer of a mobile application, namely services that can provide information and applications that make them feel more secure as the mobile health services. On the other hand users are more willing to pay and use more frequently mobile applications mainly to fulfill their emotional needs. Thus some first conclusions derived from these studies reveal that both the enabling technology and the functionality of the mobile services should adapt to a social context if the objective is to increase usage rates. Although the technological features play an important role in the adoption of mobile data services, the increase in usage is not proportional to functionality these applications provide but it is proportional to the emotional fulfillment these services provide to their users.

Thus the mobile service providers have to consider that the mobile applications that provide functional benefits to the users could generate revenues not from their actual use and the revenues the bandwidth consumption will generate but more by using these applications as added value services.

IV. CONCLUSION

Critical aspects of the applications of mobile-health systems and information related services are investigated in this paper in an attempt to identify and overcome the usage behavior of their users. What the study revealed is that it can not be expected heavy use and heavy bandwidth consumption of mobile applications that fulfill only functional needs of their users. The case study of the information based applications the Service A provided revealed that the surrounding environment impacts behavior of users and those users require specific characteristics of the spaces in order to start using mobile applications. Thus the fact that there are fewer options of “suitable” spaces to use mobile applications during everyday settings make the “anytime anywhere” ability to use mobile services a myth. For example within urban daily settings users confront inconvenient times since they are busy and have no time to stand or sit and use mobile data services. Thus I argue
that space matters and limits the options people have to use mobile data services when outside the home establishments.

The data came from the mobile health services revealed on the other side that the users are not willing to use daily and for long time periods such devices even if they are asked to do it. Off course as the users argued, they believe in the necessity to own such applications and temporarily use them. This attitude has to make mobile service providers look for other business models to benefit from these services.

Finally the paper pointed out that the mobile applications should provide more emotional benefits to their users and should allow them to be connected with their social environment. This will modify the unidirectional services into bi-directional services increasing their usage rates.

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