ORIGINAL ARTICLE

The core readiness of Sleman Region community on mobile health implementation: a qualitative study

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ABSTRACT

Introduction: The innovation of healthcare technology has developed rapidly, including mobile health (mHealth). The success of mHealth implementation in community settings is influenced by core readiness factors, distinctly community needs towards mHealth. This study aims to explore the core readiness of the Sleman Region community on the use of mHealth, specifically, the features needed and the determining aspects of acceptance.

Methods: This study used a qualitative design and conducted in-depth interviews with 13 community members. Participants were chosen purposively by the Public Health Centre with various characteristics from January to March 2020. The verbatim transcripts were analyzed using the direct content analysis technique with peer debriefing.

Results: Five themes of core readiness are identification of needs obtained feature needed, satisfaction and dissatisfaction when using existing applications, knowledge of mHealth potency including advantages and disadvantages, acceptance of aspects that determine the use of mHealth, and enthusiasm for future mHealth that including reasons whether using the application or not. Specifically, the following features needed in the community are health information, self-medication, online consultation, mapping of healthcare services, peer support groups, health promotion, personal training, emergency, personal health records, and features for specific groups. The eight determining aspects of mHealth influencing community acceptance are interface design, easiness, content delivery, cost, promotion, performance, safety, privacy, and sustainability.

Conclusions: The findings indicate that the Sleman Region community stands ready to accept the implementation of mHealth based on core readiness exploration. These findings can become a consideration in the development of future mHealth applications.

Keywords: community needs; core readiness; health apps; healthcare innovation; mobile health.
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INTRODUCTION

There are more than half of Indonesian residents who have smartphones, however, the rise of smartphone users in Indonesia is not followed by the health literacy level. In 2015, data shows the level of literacy in Indonesia occupied 77th out of 160 countries, while in ASEAN level occupied the seventh position.[1,2] Studies have shown that low-level literacy affects individual health status, such as low health awareness, disobeying medical therapy, poor disease prevention, and often undergoing hospitalization.[3] These conditions indicate a need for effort to improve health, one of them being through technology. One of the developments in health technology fields could become a solution to increase health literacy through mobile health (mHealth). mHealth is defined as using electronic devices for health purposes such as monitoring and accessing health information.[4] Many health technology inventors are massively developing and implementing mHealth in the community.

According to Khatun et al., community readiness becomes a determinant factor that influences the success of mHealth implementation.[5] It is defined as the capacity of a community to accept interventions or programs that consist of the core, motivational, technical, and resources.[6,7] According to Jennet et al., core readiness identifies the community's need to adopt health technology based on satisfaction with the current health status and willingness to change.[7] Core readiness can be identified by conducting the need assessment as the first step for

implementing mHealth.[8] This effort is needed for the population target (target users) to know the information about core readiness so that it could bring up various potentials for the development of mHealth in the future.[9]

As a part of Yogyakarta Province, the Sleman Region became the top two of the highest information and technology development index (IP-TIK) in Indonesia.[10] Sleman Regency has also become one of the districts that follow the smart city movement-a concept to integrate information technology in various aspects of life.[11] However, no study identified the core readiness of mHealth implementation, especially in the Sleman Region. In contrast, this aspect is essential as a base of mHealth development so that the community can utilize mHealth

effectively daily. This study aims to explore the core readiness of the Sleman Region community on the use of mHealth, specifically, the features needed and the determining aspects of acceptance.

METHOD

This study used a qualitative research design and conducted face-to-face, in-depth interviews with community members as participants with different characteristics from January-March 2020 in Moyudan and Gamping district, Sleman Region. These districts were chosen purposely to represent the inclusivity of urban and rural category respectively based on the classification provided by Statistics Indonesia (BPS).[12] Participants were determined using a purposive-sampling technique with a variation-sampling subtype, considered based on gender, education level, occupation, age, economic status, and residency. The participant's inclusion criteria were age productive (15-64 years old), smartphone user, and voluntarily disposed of in the research. There were 13 participants involved in the interview, and after interviewing the 13th participant, the data reached saturation. All participants had no relationship with the researchers before.

All of the researchers are female and have a nursing educational background (AS, AP, KY). AP has experience conducting qualitative research. AS plays the role of interviewer, using semi-structured questions developed from literature and discussion. The interviews were collected using an audio recorder within 30-45 minutes. The researcher also took field notes during interviews. Furthermore, the recordings are transcribed in verbatim format and then analyzed manually in Microsoft Word and Excel using the direct content analysis technique with peer debriefing among all researchers to build themes.

This research followed the Ethical Guideline for Health Research in the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, and was approved by the Health Research Ethics Committee (number KE/FK/0901/EC/2019). Participants were provided with written and oral information about this research and informed of their right to withdraw without negative effects.

RESULT

Participants Characteristic

The characteristics of participants can be seen in Table 1 below. Among 13 participants, there are two participants who has healthcare education background, respectively, P5 and P12.

Identification of needs

There are ten features obtained from participants:

a. Health information feature

The community is willing to access various health information, including disease information (including etiology, symptoms, prevention, and treatment), healthy lifestyle information, drug information, and specific information (related to reproductive health, mental health, and special needs groups). Health news, health data, myths-facts explanations, and health education from healthcare professionals and the government are also needed.

"...we can get the latest health information related to health issues that are trending because sometimes we don't find the evidence if it comes from social media." (P13)

b. Self-medication feature

Self-medication is the individual's ability or desire to independently determine diagnosis, intervention, and prevention. Its components include self-screening based on symptoms, possible initial diagnosis, and follow-up treatment (medication, treatment, or reference).

"..so at least if we are sick, we can know, oh if the body temperature is like this, I have to take paracetamol like that... maybe a drug suggestion, but it is more like if we input the symptoms, what will the indications be.." (P6)

c. Online consultation feature

The online consultation feature is one of the telehealth forms where users can ask questions and interact with healthcare professionals via video call.

"…Moreover, online consultation is very much needed in this era. Because right now, if we want to find the time, it is challenging. I do not have time to go to the doctor." (P11)

Table 1. The characteristics of participants

Participant code	Sex	Age (year)	Education (degree)	Occupation	Income* (min. wage)	Residency
P1	Female	49	Middle school	Housewife	<	Urban
P2	Female	33	Middle school	Housewife	<	Urban
P3	Female	40	High school	Housewife	<	Urban
P4	Female	21	High school	Student	<	Rural
P5	Female	19	High school	Student	<	Rural
P6	Male	22	High school	Student	<	Urban
P7	Male	24	High school	Self-employed	>	Urban
P8	Female	25	Bachelor	Self-employed	>	Rural
P9	Female	62	High school	Self-employed	>	Urban
P10	Female	27	Diploma	Laboratorian	>	Rural
P11	Male	52	Bachelor	Teacher	>	Rural
P12	Male	50	Master	Civil servant	>	Urban
P13	Male	38	Bachelor	Teacher	>	Urban

Income was determined by the regional minimum wage (Rp.1.000.000); "<" below and ">" above

d. Mapping of healthcare services feature
This feature aims to provide information about the closest healthcare facility to the user, such as hospitals, public health centres, and private practices (physicians, dentists, nurses, psychologists, and physiotherapists). The location, service schedule, and online reservation are also needed. In addition, this feature can provide information about surroundings updates (such as disasters).
"…maybe it can be like this doctor here and there because you do not know where the doctor's practice…" (P8)

e. Peer support group feature
This feature facilitates patients joining a group or community to share their experiences facing the same disease and receive support.
"Then maybe, for example, someone who has DM or hypertension or asthma, a group can be made so that they can share their stories." (P12)

f. Health promotion feature
Participants evaluated that health promotion activities through mHealth are also necessary, especially the innovation of methods in fun ways, such as quizzes or gamification.
"You can also give health warnings, like in an application that takes care of your health…" (P8)

g. Personal training feature
The participants expect this feature to help the user reach health goals, especially related to diet and exercise programs. The diet program needs nutritional status and calorie intake. In the sports program, the body endurance alarm is expected to prevent injury during exercise. Participants are also likely to interact with personal trainers who can give feedback to the user.
"…oh yeah, maybe it is like there is the personal training, right, because I want to lose weight, so we can consult through an application like that and monitored by the personal trainer…" (P4)

h. Emergency feature
Society often experiences confusion and panic when faced with an emergency. To resolve this, the participants expect a feature that can guide them through first aid and how

to contact an ambulance or emergency department.
".. how to handle it before going to the doctor. Then how to handle emergencies, such as fainting. That is also important." (P8)

i. Personal health record feature
This feature aims to record the user's health information data, such as demographic and health history, through manual entry and sensor tracking devices. These data are then processed, resulting in users' health profiles. Participant also expects these data could be synchronized with an electronic medical record in the hospital.
"In addition, general health data related, for example, vital signs, if you can enter and can be known from day to day, including weight, can also be entered. Including lab results can be entered so that they can be monitored from month to month." (P12)

j. Feature for specific groups
Besides the features already mentioned at nine points above, some participants also said that customized unique features for specific targeted group populations are also required, for example, features related to pregnancy and health monitoring for the elderly.
"… it can also be added for pregnant women; they often see or read the information on the internet about food and the development of their baby" (P8)

Satisfaction in adopting mHealth
Satisfaction in adopting mHealth is an experience the community feels using the current mHealth. Some of the participants have used the mHealth with health information feature, personal training feature, personal health record feature, and pregnancy feature. Based on participants' experience, the previous mHealth that has been used has several weaknesses, such as the low accuracy of the sensor, expensive subscription fees, mismatch promotions offered, and difficulty accessing information because of misuse of keywords.
"For that, Ms. I wanted to look for something, and then I entered the keyword, but the answer to the keyword I entered did not come out." (P11)

Knowledge of mHealth potency
Knowledge potency is the ability to identify various possibilities in mHealth development. The potency of mHealth could be seen by identifying benefits and losses. Based on the interview, some participants mentioned that mHealth has advantages, such as making it easy to access information and improving knowledge related to health. Information access is also becoming more efficient in terms of cost, time, and effort than without mHealth. However, mHealth also has adverse risks that need to be anticipated, like data misuse.
"…then like that (mHealth) also seems to make it easier for us to find out what about our health without us having to go all the way to the doctor to the midwife or to the nearest clinics like that." (P5)

Determining aspects of community acceptance
This research shows nine determining aspects that influence people using mHealth.

a. Interface design
Users are becoming primary concerns about colors, fonts, icons, and layout selections. Participants avoid using contrast and unmatched color designs and prefer soft colors like blue, green, or white. The logo and icon should be created based on mHealth's function and purpose. The font style should also be consistent and easy to read. Finally, the layout design must be able to adjust to various types of smartphone screens.
"What I mean is, if you press it (the button), there's a lot of display, there is a video or something like that. Maybe it is better to keep things simple first from the information so the information itself is categorized. Right, so that people who have never used it can know. Oh, this is this section, this is this section. So the point is it is more plotted." (P6)

b. Easiness of use
Participants prefer a simple system and flow so they can easily understand how to use mHealth. The more straightforward design and flow make participants feel more comfortable using it, even for ordinary people. Column data filling in mHealth should be avoided. Guidance to operate

mHealth should be provided for the user.

"… because this system will be used in the general public, then make the system as simple as possible so it's not long-winded…." (P11)

c. Promotion

Participants state that advertising mHealth is needed, for instance, through social media and socialization.

"I think it is better to be promoted, especially in schools, so that high school students and college students know. It is because they do not know there is a health application." (P8)

d. Performance

mHealth should be compatible with the lowest smartphone specifications owned by most of society. The program also can be run both online and offline. Battery, memory, and internet data usage are also becoming participants' concerns.

"…because we want to make an application that is intended for the community, we make an application that can be used on cell phones with the lowest specifications." (P6)

e. Content delivery

Various methods for delivering information in mHealth are also needed. Besides writing content, pictures/illustrations and videos can make the information delivery more communicative. Participants also stated that the data should be delivered in short, concise, and minimal medical terms. Related to language, participants also expect there are languages choice that can be customized.

"I prefer videos and pictures because if the article is too long, I am lazy to read it. Suppose the picture is given a little information like that. If the video, if possible, is short but detailed, it will be clear. If it is long, people are lazy to watch it, so it is better to keep it short but informative." (P8)

f. Cost

Most participants responded that free access is the drawback of paid mHealth. However, some participants have no drawbacks to paid mHealth as long as the subscription cost is not too high. To determine the cost of a subscription, the developer should pay attention to the Public Health Centre rate, monthly cost quota/credit, and quality of the mHealth.

"I think the good ones are the ones that free... If I am told to pay, I will not use the application." (P8)

g. Privacy and security

Security and privacy have become a concern for mHealth development. mHealth developers must guarantee that user data can be protected in secrecy from irresponsible parties.

"…but the data must not be misused. From the data security system, at least someone should be responsible for it. Because data like this can be traded, it is possible." (P12)

h. Sustainability

The final aspect of mHealth acceptance is Sustainability. Participants were advised to update the better version mHealth frequently and consistently.

"Yes, I hope the application is consistent, you can use it continuously, if it can last a long time, not just for a moment like that. Right now, many applications are only temporary. I hope they can be upgraded or updated continuously." (P8)

Enthusiasm in future mHealth

From the interviews, most participants from urban and rural area stated that they would use the future mHealth. However, there is also a participant who would not. The reasons for the enthusiastic participants are related to necessity, especially regarding specific features also needed by the community and motivation to live healthier lives for individuals and families. Besides that, some participants said they would use it because they desired to try a new mHealth application. On another side, the participants said they would not use health delivered because they were worried about being unable to operate mHealth properly.

"If it already exists and is in accordance with what we need, why do not we use it" (P13)

"I'm afraid I'll press the wrong button when using it" (P2)

DISCUSSION

The research setting is in the Sleman Region, where the participants are primarily Javanese. Javanese are an ethnic group that has culturally adhered to showing obedience and a positive attitude towards anything.[13] This characteristic could affect their information/answers, which can be biased to please the other, in this case, the researcher.

Overall, there is no specific difference in information for both rural and urban areas related to the identification of needs, satisfaction with adopting mHealth, knowledge of mHealth potency, determining aspects of community acceptance, and enthusiasm for future mHealth.

Community knowledge and interest toward mHealth

In general, few of the participants who had low education levels and were elderly were not familiar with mHealth and feared operating mHealth on smartphone devices. This result is in line with the study by Carroll et al. that individuals older who had low education background and aged more than 45 years old tend to have low levels of mHealth use. This perception is possibly caused by a low education level that could make somebody feel they do not have enough skills to use electronic devices.[14]

Most participants who are highly interested in mHealth had the same considerations related to the positive impacts and benefits on health. This study is in line with the previous study that the interest in adopting mHealth is based on perceived usefulness, convenience obtained, and subjective norm.[15] According to Sun et al, the subjective norm is illustrated in the importance of mHealth for themselves, their family, and those closest to them.[16]

A good strategy is needed to increase interest in adopting mHealth. Zhao, Ni, and Zhou stated that there are two other compelling reasons why people use mHealth: vulnerability and severity of the disease.[17] The second reason could become a strong reason for adopting mHealth., especially for someone with a chronic disease.

From the gender aspect, there is a similarity between men and women. Guo et al. disclosed a different view of interest between males and females in using mHealth. In women, the desire

to use mHealth is driven by the severity and vulnerability of condition health, while men have an interest in using new technology.[18]

Previous research has shown a correlation between interest and readiness.[19] Based on the enthusiasm for using mHealth, the Sleman Region community is ready to accept it.

Features needed by the community

The specific aim of this study is to identify the features and needs of the community so that the elements could help to solve the community's current problems. Gandy et al. also showed that needs identification is essential before developing a new system for society.[9]

The participants rated that the health information feature is beneficial for increasing health quality. The increase could influence this statement in disease prevalence and low health literacy that make the community need information access. This feature can be a solution for users to achieve health quality because it helps the decision-making process for users related to treatment.[20]

The second needed feature is related to self-medication. A previous study in Yogyakarta found that many people do self-medication by buying drugs without a recipe and using herbal plants.[21] Self-medication became a health disruption with pros and cons, especially related to the risk of misdiagnosis. To avoid misdiagnosis, current mHealth uses various sensors of smartphone devices such as a camera, microphone, and accelerator for recognizing the user's body response, like breathing patterns using face recognition and pulse through hand vibration. The physician will then analyze the data to decide on the proper diagnosis by online consultation.[22] Agarwal and Biswas compared 22 online consultations mHealth. This study found that most mHealth used by Indians featured various consultation methods (chat, voice calls, and video calls), remote online consultation, and referral suggestions.[23]

The high prevalence of non-communicable diseases affects the healthcare worker to do more health promotion. Many mHealth developers try to conduct innovative health promotion strategies through gamification methods and daily challenges for users. Another approach is by adopting the concept of social media, where users can promote each other's health to other users through the sharing feature to make users motivated to live a healthy lifestyle.[24]

The next feature is peer support groups that could allow patients with specific or chronic illnesses to interact with the same condition. According to a previous study, this feature will enable users to share experiences, feelings, knowledge, and skills in facing their situation. The study also shows that this feature could lower the social isolation level. However, this feature also could bring a negative impact where the user is possibly able to compare their health condition with other users.[25]

Participants also mentioned the need for a health facility mapping feature, particularly with online reservation and environmental status. This feature uses GPS (Global Position System) to help users know nearby location healthcare services.[26] The feature is also correlated to the emergency feature, which is driven by the lack of knowledge and information about proper first aid and essential life support. According to Gonzalez et al., emergency features must utilize advanced technology components such as cloud services, distributed services, internet-of-things (IoT), machine-to-machine, vehicular ad-hoc networks, and architecture services.[27] Various component technologies should be connected so that they can give accurate information as well as increase quality service.

A popular feature mentioned by participants is personal training, pushed by the frequency of social media use among teenagers to get recognized and appreciated. This feature potentially helps the user behavior to become healthier. The study by Higgins categorizes seven subtypes of this feature: challenge, tracking, analysis, weight, eating pattern, sleep, and specialized type. Various software or applications provide this feature with virtually interacting with the trainer, goal setting, monitoring, progress, feedback, synchronization with other devices, and sharing through social media.[28]

The next feature is the personal health record, which is also a necessity, especially with the development of electronic health records or medical records. This feature could provide many benefits for users, such as access to information related to health conditions at various times and places as long as they are connected to the internet. This feature can also simplify the management of insurance claims and can anticipate the occurrence of predictable emergency conditions. Even so, the main challenges that must be faced in carrying out this feature are related to legal and privacy aspects.[29] In developing mHealth with personal health record features, mHealth developers can integrate various technologies to improve application usability. Different technologies such as GPS, accelerometery, and biological sensors can collect various user health data.[30]

The last feature reasonably needed by the community is a feature for particular groups or vulnerable groups. The reason people need this feature can be encouraged because there are family members or their closest people who are a particular group. Previous research shows that mHealth interventions can positively impact vulnerable groups in helping self-management, healthy living behaviours, and chronic disease management.[31]

Aspects that affect the acceptance of mHealth

The results of this study indicate that the community identifies eight elements considered in adopting mHealth. This aspect can be a driving force or an obstacle for someone using the mHealth application.

The first aspect is appearance and convenience. This aspect can determine the sustainability of users in using mHealth. The user experience of effectiveness and comfort is essential to mHealth development. According to Ross and Gao, in the display aspect, six things need to be considered, namely icons, layout, navigation, content, images, and colours.[32] The appearance and ease of mHealth can be tested using a usability test on the prototype application. If the results are not optimal, the developer can make improvements to the application and retest it until feasible or usable.[33]

According to the interviews, public

acceptance of mHealth related to content delivery is determined by the delivery media and language use due to the diverse characteristics of the community. According to previous research, people need applications with easy-to-understand language and are encouraged to use media such as pictures and videos to clarify the information conveyed.[34] Effective content delivery can be started by identifying the target users of mHealth. Developers can discover health literacy levels, communication and language patterns, technology skills, interests in health topics, health beliefs, and attitudes.[35]

Vo, Auroy, and Sarradon-Eck add an important aspect required by the user, personalization, where users can make settings such as language choices, profile photos, notifications, and display font sizes according to taste.[25] This aspect can make users get positive interactions when using the mHealth application.

Regarding the performance aspect, informants conveyed that the low level of accuracy, especially on sports and tracking features, reduced user satisfaction with mHealth. In addition to battery and internet network usage, mHealth's performance also depends on the user's smartphone specifications, such as screen size, processor, memory, bandwidth, and other.[36] Therefore, mHealth developers need to consider the features offered and the types of smartphones owned by the community.

Another critical aspect is promotion. Application promotion is needed to increase public awareness of using mHealth. According to Akter and Ray, mHealth developers need to raise awareness of the importance of the mHealth application to the public by utilizing communication media such as television, radio, newspapers, and other promotional media.[36]

Regarding costs, although all participants in the results of this study expect free access to mHealth, previous research has shown that this does not guarantee user satisfaction. Oppong et al. revealed that by implementing paid features, users would be more satisfied with mHealth. This case cannot be separated from the quality of the features offered by mHealth.[37]

Security and privacy are very concerned with users, especially personal data, which is considered quite sensitive. Users feel entitled to know who can see the data and the possibility that the data could be leaked. Research shows that mHealth users in Switzerland are aggrieved if the data can be accessed by other parties, especially pharmaceutical and insurance parties.[25]

The last aspect that needs to be considered in the development of mHealth is sustainability. Muhambe stated that three main factors need to be evaluated regularly to sustain the technology: individual, technology, and management. Personal factors include user satisfaction, system access, and user support. Technological factors include system interoperability, system scalability, system relevance, system quality, and technology sustainability. Finally, the management elements are composed of ownership and profit. With this evaluation, developers will be encouraged to be able to innovate in developing mHealth so that sustainability can be achieved.[38]

CONCLUSION

This qualitative study concludes that the people of Sleman Regency are ready to accept the mHealth application based on their knowledge and enthusiasm for mHealth technology. Future mHealth needs to consider the features, acceptance aspects, and experience of people toward this technology. This study has a limitation regarding to the absence of triangulation in the research methodology. The recommendation of the prospective study is to complete these findings by conducting triangulation to policy maker or stakeholder and to continue the quantitative study approach.

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CONFLICT OF INTERESTS

The authors declare that there are no competing interests related to the study.

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