# Empirical Study on Online Health Information Seeking and Health App Usage

Kavin Asavanant[1, *], Pattarasinee Bhattarakosol[2] and Wilert Puriwat[3]

[1] Technopreneurship and Innovation Management
Graudate School, Chulalongkorn University
Bangkok, Thailand

[2] Faculty of Science, Chulalongkorn University
Bangkok, Thailand

[3]Chulalongkorn Business School, Chulalongkorn University
Bangkok, Thailand

[*]*Corresponding author's email: kavin [AT] cbs.chula.ac.th*

**ABSTRACT—** ***Objective: This study aimed to examine Thai smartphone users in term of their online health information seeking and health apps usage behaviors.***

***Methods: The researchers conducted a cross-sectional survey of 203 smartphone users throughout Thailand. The 37-item survey assessed socio-demographics characteristics, multiple dimensions of people's health-information levels, experiences in finding health information online, reasons why people are using or not using the health apps, and perception towards paying for health information online.***

***Result: Most smartphone users had used internet to search for health information (193/203, 95.1%), but less than half (82/203, 40.4%) of those users had used health-related mobile applications. The most cited reasons why Thai people did not use health apps were not trusting the medical information, thinking that the apps were not useful, and worrying that their health information was insecure. Among the people who had used health app, the most common category was fitness/exercise apps, and diet calorie calculation apps. The cost of the apps was an important factor. Only 16.57% of users were willing to pay to use health services, while 23% mentioned that they would not use the app at all.***

***Conclusion: While there are many health-apps available, most of Thai people still did not use health apps. The researchers believe that there are opportunities in the healthcare app services, particularly in the domain of medical knowledge providers. Developers who are interested in creating health apps should focus in medical information accuracy in order to earn users trust in the applications.***

**Keywords—** Mobile health, smartphone, telemedicine, health apps, online health behaviors

## 1. INTRODUCTION

Thailand is a developing country with a high mobile phone penetration rate at 125% [1]. The country has a population of 68 million people who are using almost 26 million smartphone devices [1]. One important thing about smartphone users is that they can download any kinds of apps and use them on their smartphones. The download and usage behaviors are varying country by country. According to the 2016 survey from Google, on average Thai smartphone owners had 32 apps installed on their phones [2]. The top 3 most used app categories were game, social media, and chat application [2]. In addition to the entertainment and communication values, many researchers had explored how health-related apps could promote healthy behaviors among their users and serve as another channel for health data-monitoring [3]. In 2015, there were more than 165,000 health-related apps available to download on both the Apple AppStore and Google Play Store [4]. Health apps in the market covers many domains including but not limited to giving exercise guidance, tracking calories intake, managing chronic disease, and helping with self-diagnosis.

Though there are organizations such as IMS Health from USA or National Health Service (NHS) from UK, that had researched in the domain of health-related applications, the field is still in its early stage, especially in Asia. There had not been a study done among health apps developers in order to understand their creation process. According to the analysis done by the IMS Health, the team had reported that almost 80 percent of the apps that labelled themselves as

"health and wellness" or "medical" apps were just simply providing static information which did not have any evidence to support their claims [5]. Only 20 percent had the functionality that could take users inputs and facilitate the actual change behaviors [5]. Thus, at the current stage, the majority of the health apps had limited functionalities and could only providing health information, much of them also lack supported evidence [5].

Realizing the issues facing health apps, some researchers had proposed a way to evaluate and measure the quality of the health applications [6] [7]. For example, Stoyanov et al proposed a Mobile Application Rating Scale (MARS) to evaluate the quality of health-related applications [6]. The scale comprised of 4 main domains which are Engagement, Functionality, Aesthetics, and Information [6]. Nevertheless, these measurements had yet reached to the general public.

In addition, information regarding the usage of health apps among the general population was also lacking. Most of the studies that measured the adoption of health apps were mainly done in a specific user group such as people with diabetes [8] or people with chronic diseases [9]. Google Play store does provide number of downloads for any apps, but the studies had shown that such information whether it was rating, feedbacks, or number of downloads were easily manipulated and unreliable [10] [11]. Moreover, the app store cannot provide information on users' demographics, their usage motivations, or any insights on what functions they wish to have. Thus, the aim of this study was to find out different aspects of people's attitudes towards the use of health-apps via a survey of smartphone users in Thailand.

## 2. METHODS

### *2.1 Sample and Procedure*

According to Kaplowitz et al, an online survey has many advantages over traditional paper-based survey, including lower costs, faster responses, and geographically unrestricted sample [12]. The research was carried out in the form of web-based survey, using the SurveyMonkey tools. The survey was translated into Thai language. To recruit the participants, the researchers posted the survey questionnaire on Pantip.com, a very popular discussion forum in Thailand. The researchers chose to post in the topics related to health and wellness in order to make the questionnaire relevant to the audience. The purpose of the survey was explained in the discussion forum. In addition, the researchers offered a small incentive which was a chance to win a Line Sticker gift for those who helped complete the questionnaire (Line is a chat application with the most users in Thailand). In order to make sure that the questionnaire had covered Thailand, the researchers also reached out to their university professor colleagues who are working in different parts of Thailand. The researchers asked them to help distribute the survey in their networks. The survey was conducted in March 2017. By the time the survey was closed, 797 people visited the survey, 223 people participated in the survey, which resulted in 203 completed questionnaires. Table 1 presents the demographics of the survey participants.

**Table 1:** Sample demographics of this study

| | Number | Percentage (%) |
|---|---|---|
| Gender | | |
| Female | 124 | 61.1 |
| Male | 79 | 39.9 |
| Age | | |
| Under 21 years old | 21 | 10.3 |
| 21 – 30 years old | 66 | 32.5 |
| 31 – 40 years old | 71 | 35.0 |
| 41 – 50 years old | 36 | 17.7 |
| 51 years old and above | 9 | 4.4 |
| Education | | |
| High school or below | 12 | 5.9 |
| Bachelor degree or equivalent | 98 | 48.3 |
| Higher than bachelor degree | 93 | 45.8 |
| Location | | |
| Bangkok Metropolitan | 64 | 31.5 |
| Central region (excluding Bangkok) | 33 | 16.3 |
| Northern region | 34 | 16.7 |
| Northeastern region | 42 | 20.7 |
| Southern region | 30 | 14.8 |

| | | |
|---|---|---|
| Occupation | | |
| Government officers/civil servants | 30 | 14.8 |
| Employees in private companies | 89 | 43.8 |
| Business owners/freelancers | 45 | 22.2 |
| Students | 39 | 19.3 |

Previous research has shown that people who are interested and volunteering to participate in the survey are more likely to give complete responses than who are not self-selected volunteers. Moreover, the validity of any methodology depends on volunteers who is willing to provide meaningful and accurate responses [13]. The survey website has an ability to keep track of those who have visited whether they have completed the surveys or not. The response rate was 26% even when we excluded surveys that are incomplete.

### *2.2 Survey Items*

The survey had 37 questions asking the audience in 4 domains: demographics characteristics, attitude and behaviors towards personal health, attitude and behaviors towards online health information, and attitude and behaviors towards using health apps on smartphone. In the domain of attitude and behaviors toward personal health, the survey measured the participant's health consciousness level and how frequent they visited the doctors in a year. The health consciousness level was operationalized by adapting Dutta-Bergman's scale of health consciousness attitude [14]. It was a 5-point Likert scale ranging from 'Strongly disagree' with the value of 1 to 'Strongly agree' with the value of 5. The original Dutta-Bergman's scale of health consciousness consisted of 5 items, but due to the already-lengthy survey, we trimmed the scale down to 3 items. The reliability for this measurement ($M = 4.11$, $SD = 0.74$, $n = 202$) was acceptable ($\alpha = 0.82$).

In the domain of attitude and behaviors towards online health information, the survey aimed to measure the health information orientation level, eHealth literacy level, and online health information efficacy level. The 3 variables were measured in the form of 5-point Likert scale similarly to the one used for health consciousness level. The health information orientation level was also derived from Dutta-Bergman's scale of health information orientation [14]. Three out of 6 items were selected to measure this variable. However, after running the reliability test, we discovered that the measurement for this construct was not reliable ($\alpha = 0.68$), therefore we excluded it from further analysis. The eHealth literary was adapted from the scale proposed by Cameron and Harvey [15]. Three out of 6 items were selected to operationalized the eHealth literacy variable. The reliability for this measurement ($M = 3.79$, $SD = 0.69$, $n = 202$) was acceptable ($\alpha = 0.72$). The online health information efficacy level was adapting from the original scale of computer self-efficacy proposed by Compeau and Higgins [16]. Three out of 4 items were selected to measure this variable. The reliability for this measurement ($M = 3.85$, $SD = 0.74$, $n = 202$) was acceptable ($\alpha = 0.79$).

In the last domain, the researchers aimed to find out the current attitude and behaviors of health-app usage among Thai population. We would like to find out whether people were using the health apps or not. If so, what kind of health apps were they using? If not, what were the reasons that holding them back. We also asked futuristic questions on health app features that participants were interested in using and how usage cost would affect their adoption decision.

### *2.3 Data Analysis*

All the survey data was coded and entered into IBM SPSS Statistics version 22 running on Mac OS platform. All items were calculated for their descriptive statistics. In order to conduct the quantitative analysis, we used multiple methods depending on the type of the variables. That is, for categorical variables, we employed Pearson's Chi Square Test of Independence and for continuous variables, we employed Point-Biserial Correlation method. The analysis assessed whether the following variables had a correlation with using the health apps: age, gender, education, smartphone operating systems, health consciousness level, eHealth literacy level, and online health information efficacy level. Statistical significant was determined by P value less than 0.05.

## 3. RESULTS

### *3.1 Personal Health and Online Health Information Characteristics*

Out of 203 participants, 193 (95.1%) people had searched for health information online. Of those who had searched for health information online, the top 3 reasons were finding information for their own illness (80.8%, 164//203), finding information for people they care about (57.1%, 116/203), and preparing themselves for the visit to the doctors (52.7%, 107/203). When asking about how often do people read about health information, 31% (63/203) said that they actively read it once a month, 27.1% (55/203) actively read it once a week, and 20.2% (41/203) reported that they did not read at all. In term of how many times in a year that they made a visit to the doctors, 28.1% (57/203) said that they visited the doctors once a year, 22.2% (45/203) visited 2 times a year, and 21.7% (44/203) said they visited fewer than once a year. Table 2 shows a detailed finding of personal health characteristics.

**Table 2**: Findings on Personal Health Characteristics

| | Number | Percentage (%) |
|---|---|---|
| Have you ever searched for health information online or from smartphone apps | | |
| Yes | 193 | 95.1 |
| No | 10 | 4.9 |
| The purpose of searching for health information online or via smartphone apps | | |
| Want to know about your own illness and how to treat yourself | 165 | 80.8 |
| Someone you know become ill and you like to help | 116 | 57.1 |
| Want to get information before seeing a doctor | 107 | 52.7 |
| Find information on situational outbreaks for preventions | 75 | 36.9 |
| Others | 10 | 4.9 |
| How often do you read about health information? | | |
| Everyday | 11 | 5.4 |
| Once a week | 55 | 27.1 |
| Once a month | 63 | 31.0 |
| Once every 3 months | 33 | 16.3 |
| Not at all | 41 | 20.2 |
| In a year, on average, how many times do you go to see a doctor? | | |
| Fewer than 1 time | 44 | 21.7 |
| 1 time | 57 | 28.1 |
| 2 times | 45 | 22.2 |
| 3 times | 25 | 12.3 |
| 4 times | 3 | 1.5 |
| More than 4 times | 29 | 14.3 |

For the health consciousness level measurement among the participants, the combined mean value was 4.11 with standard deviation of 0.74. The combined mean value of eHealth literacy was 3.79 with standard deviation of 0.69. The combined mean value of online health information efficacy was 3.85 with standard deviation of 0.74. Table 3 shows a detailed result for responses in the domain of personal health and online health information characteristics.

**Table 3**: Personal and Online Health Attitude

| Construct | Measure | Mean | SD | Reference |
|---|---|---|---|---|
| Health Consciousness (Cronbach's $\alpha = 0.82$) | | 4.11 | 0.74 | Dutta-Bergman (2004) |
| HC1 | I do everything I can to make myself healthy | 3.94 | 0.90 | |
| HC2 | Having a healthy body is very important to me | 4.44 | 0.81 | |
| HC3 | I proactively prevent myself from getting injured or getting sick | 3.95 | 0.88 | |
| eHealth Literacy (Cronbach's $\alpha = 0.72$) | | 3.79 | 0.69 | Cameron and Harvey (2006) |
| EHL1 | I know how to find health information on the internet | 4.04 | 0.86 | |
| EHL2 | I can apply and benefit from health information that I find from the internet | 3.88 | 0.83 | |
| EHL3 | I can tell whether health information I find on the internet is good or bad quality | 3.44 | 0.91 | |
| Online Health Information Efficacy (Cronbach's $\alpha = 0.79$) | | 3.85 | 0.74 | Compeau and Higgins (1995) |
| OHIE1 | Finding information on the internet is easy | 4.04 | 0.82 | |

| | | | |
|---|---|---|---|
| OHIE2 | It is easy to search for health-related information on the internet | 3.96 | 0.83 |
| OHIE3 | If I have a question about health information from the internet, I am confident that I can find an answer. | 3.53 | 1.0 |

### *3.2 Health App Usage*

The majority of respondents used Apple iPhone as a smartphone of their choices (129/203, 63.5%), with the second biggest group using Samsung (80/203, 39.4%). Regarding whether the respondents had downloaded and used health-related applications, 59.6% (121/203) stated that they had not used any health apps, and only 40.4% (82/203) said that they were currently using health-related apps. The top 3 reasons cited by those who were not using health apps were they did not trust health information inside the app (41.3%, 50/121), they did not think the apps were useful (31.4%, 38/121), and they believed the apps had a bias information (28.9%, 35/121). Out of those who stated that they used health apps, the top 3 kinds of apps being used were apps that helped users learn and facilitate exercising activities (59.8%, 49/82), apps that helped track diet and calories intake (48.8%, 40/82), and apps that helped track physical activities such as walking, running, or sleeping (40.2%, 33/82). When asked about how important it was for the health-apps to be free using a Likert scale of 1 as 'not important' and 5 as 'very important', we found that it was both very important to users that the apps were free to download (M = 4.46, SD = 0.74) and the services inside the app were free (M = 4.44, SD = 0.75). When we asked how should the users compensated the application developers for their work of creating health apps, only 15.8% (32/203) stated that they were willing to pay in monetary value. The majority of the respondents (53.2%, 108/203) chose to have an advertisement inside the apps in order to keep using for free. Interestingly, 20.2% (41/203) stated that they would not use the app if there was any cost associated with it. Table 4 shows the details of the health app usage from the survey.

**Table 4**: Health App Usage

| | Number | Percentage (%) |
|---|---|---|
| Smartphone device used | | |
| iPhone | 129 | 63.5 |
| Samsung | 80 | 39.4 |
| Huawei | 14 | 6.9 |
| Others | 18 | 8.9 |
| Are you currently using any health-related applications? | | |
| No | 121 | 59.6 |
| Yes | 82 | 40.4 |
| Why are you not using any health-related applications? (n = 121) | | |
| I do not think it is not useful | 38 | 31.4 |
| I do not trust information inside the app | 50 | 41.3 |
| I do not trust developers who create an app | 19 | 15.7 |
| I think apps have biased information | 35 | 28.9 |
| Information inside the app is not up-to-date | 25 | 20.6 |
| The app lacks stability and keeps crashing | 20 | 16.5 |
| The app is hard to use | 24 | 19.8 |
| I am worried about my health information security | 27 | 22.3 |
| I have to pay to use the app | 22 | 18.2 |
| I am not aware of any good health apps | 11 | 9.1 |
| What kinds of health apps are you currently using? (n = 82) | | |
| Apps that help you track your diet and intake calories | 40 | 48.8 |
| Apps that help you exercise, exercise motivation | 49 | 59.8 |
| Apps that gives information about illness and how to treat oneself | 14 | 17.1 |
| Apps that gives information about medicines | 18 | 22.0 |
| Apps that help you track your physical activities (walking, etc) | 33 | 40.2 |

| | | |
|---|---|---|
| Apps that help with woman specific monitoring (period, ovulation) | 17 | 20.7 |
| How will you compensate health app developers for the use of their services? | | |
| Pay money | 32 | 15.8 |
| Willing to have advertisements inside the app | 108 | 53.2 |
| Choose not to use the service | 41 | 20.2 |
| Others | 22 | 10.9 |

### *3.3 Interests in Health App Features*

As mentioned in the introduction section, there are many health apps available for download in the market, however, the majority of apps mainly provide static information requiring minimal input from the users. That is, the key functions that available for users are browsing contents, consuming contents, or just examining the tracked activities. In our views, the current generation of health apps are just scratching the surface of what smartphone apps can potentially do for healthcare. As demonstrated by a multibillion dollar ridesharing company, Uber, ones could create an entirely new business domain with smartphone app technology [17]. All the ridesharing companies utilized the smartphone application platform to its fullest. We had yet to see any healthcare related services utilizing the app technology to that extent. Though some companies such as Teladoc and American Well have used the smartphone apps to pioneer in the healthcare telemedicine space, they were not adopted by the majority population yet [18]. To gauge the interests and demand in the healthcare services, we asked the participants 5 health-service features which were not available in the market yet. The 5 health-service features were the following: a feature that allows users to share their illness stories and experiences, a feature that shows an expert explaining and demonstrating how to do basic illness treatment in a video format, a feature that estimates the expenses of any medical treatments, a feature that allows you to order drugs and have them deliver to your residence, and a feature that allows you to consult with a doctor real-time through the app. The interests level was measured using 5-point Likert scale ranging from extremely interested (5), very interested (4), moderately interested (3), slightly interested, (2), and not at all interested (1). Table 5 shows what we discovered from the survey.

**Table 5**: Interests in Health App Features

| Health-service feature through smartphone app | Mean | SD | Interpretation |
|---|---|---|---|
| A feature that allows users to share their illness stories and experiences | 3.83 | 0.86 | Very interested |
| A feature that show an expert explaining and demonstrating how to do basic illness treatment in a video format | 4.06 | 0.81 | Very interested |
| A feature that estimates the expenses of any medical treatments at the hospital | 4.09 | 0.87 | Very interested |
| A feature that allows you to order drugs and have them deliver to your residence | 3.54 | 1.16 | Very interested |
| A feature that allows you to consult with a doctor real-time | 4.28 | 0.85 | Extremely interested |

### *3.4 Health App Usage Correlation*

We discovered that health consciousness level, eHealth literacy level, and online health information efficacy level were significantly related to having downloaded and currently using health apps (p-value less than .05). We did not find any significant relationships among age, gender, education level, and smartphone operating systems on the health app usage. Table 6 showed the result of the quantitative analysis.

**Table 6:** Quantitative Analysis on Correlation of Health App Usage

| Variable | Pearson value | p-value |
|---|---|---|
| Gender | 2.08 | .15 |
| Age | 6.66 | .16 |
| Education level | 2.63 | .45 |
| Smartphone Operating system (iPhone vs Android) | 0.07 | .79 |
| Health consciousness level | 0.18 | .012* |
| eHealth literacy level | 0.26 | .000** |
| Online health information efficacy | 0.28 | .000** |

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

## 4. DISCUSSION

This study examined the smartphone users' attitudes and behaviors towards health apps in Thailand. We found that less than half of the users (82/203, 40.4%) used health-apps. The top reasons why people were not using health apps were lack of trust on information inside the app, believing that apps were not useful, and thinking that the apps contained biased medical information. Among those who used health apps, fitness and exercise apps were the most popular, second by diet and calories calculation apps. About a third of health app users, had an app that helped them track their physical activities such as walking, running, or sleeping. Given that 95% of people stated that they had searched for health information online, it was surprising to discover that only 17% used health apps to find health information. One possible explanation could be about language factor. Even though, there are many health applications giving health information on the App Store. The primary language inside of those apps is English. Since, Thailand's official language is Thai and the general population is not proficient in English yet, it is understandable why Thai people will not use those apps. In addition, regarding apps that have health information in Thai, as far as we know, there are very few health apps that are created by Thai developers.

Nevertheless, we found that people are still interested in using health-related applications which can help them save time or provide them with useful medical information. The respondents were extremely interested in the feature that allowed them to consult with a doctor through the app. They were also very interested in using the app that could help them estimate the cost of any medical treatments. This gives app developers a good sign that there is demand for those services and high potential in the health-related applications. However, there is one caveat that all app developers should prepare for when creating health apps. App developers must prepare carefully for their app monetization. According to the survey, we uncovered that the majority of users (108/203, 53.2%) did not want to pay for the apps or services offered. They either chose to not use the apps or willing to have advertisement inside the apps. Before start working on creating the app, app developers should plan out their revenue source in order to make their business sustainable.

One essential contribution from this study was the correlation we discovered by doing quantitative analysis between health app usage and other variables. Even though we did not find any correlation between health app usage and demographics information, we did find that the 3 health attitude levels: health consciousness, eHealth literacy, and online health information efficacy significantly related to health app usage. This information is crucial for any developers who intend to create health apps but are unsure about who are their targeted users. According to the analysis, developers will have a higher chance of success for their health app adoption, if they focus on users who have high level of health consciousness, eHealth literacy, or online health information efficacy.

### *4.1 Limitation of the Study*

Due to the time and resource limitation, we had recruited 203 participants which might not accurately represent the population of Thailand. In addition, the study relied on self-report and consists of those who were willing to participate in the survey, therefore risking the voluntary response bias. Also, the study was conducted as a cross-sectional survey, giving the ability to understand the overall picture of health apps usage, but people attitudes and behaviors will change over time. Therefore, the researchers suggest that we revisit the topic again in the near future.

### *4.2 Future Study*

Most of the studies that examined the usage of smartphone health apps were mainly conducted in the US [19]. Due to many differences such as cultures, technological advancement, and languages, we could not generalize the findings to other regions. As far as we know, this study was the first study that examined the usage of health app in the South East Asia region. With the region's growing economy, large population, and unique national languages, South East Asia is an interesting geography that is worth conducting researches on. Aside from Singapore and the Philippines, the country in

the region has its own national language which is not English. Given that staying healthy is a universal need that every person desire for, it will be interesting to do a cross-country study on health apps usage and understand more about people's attitudes and behaviors.

App developers need to find ways to earn revenue from the health apps they create. The study showed that people were not willingness to pay for apps or services directly in the Thai market. We would like to propose that there shall be a further study on partnership between health app developers and other companies. One of the main stakeholders in healthcare business is insurance companies. Thus, it is worth exploring to understand perceptions of people in the insurance companies with regard to the usage of health apps.

Last but not least, given the high interests level of feature that allows users to consult with doctor online, one should explore the domain of telemedicine services. Though such a service has been pioneered in the US, the healthcare systems in most South East Asian countries are still in their primitive. The study of the current stage of healthcare and its readiness for telemedicine service will provide an understanding of what factors are needed in order to bring telemedicine service into reality.

### *4.3 Conclusion*

Even though health apps encourage users to live healthier, the study showed that the majority of people had not adopted them. The main reasons of not adopting health apps were lack of trusts in app's medical information, and uninterested in health apps' functionalities. Currently, of those people who used health-apps, the usage concentration was in fitness/exercise domain and diet and calories tracking domain. Because of those 2 popular domains, the public might underestimate the potential of health apps and how much they could provide values to their lives. Significant interests were shown in the healthcare-related services such as telemedicine services via applications. There is still a lot of opportunities for app developers in the healthcare area. With the support and collaboration from each stakeholder, one can create health apps that not only sustainable but also greatly benefits the society as a whole.

## 5. ACKNOWLEDGEMENT

The authors would like to thank our teaching colleagues at Chiang Mai University, Khon Kaen University, and Suan Sunandha Rajabhat University who helped distributing the survey to their networks. This research was part of the dissertation for Doctor of Philosophy degree and received a financial support from Chulalongkorn University, Bangkok, Thailand.

## 6. REFERENCES

[1] Thailand's Telecom Market end of 2015 [internet]. Yozzo ICT Consulting Firm; c2016 [cited 2017 Mar 12]. Available from: https://www.slideshare.net/yozzo1/thailands-telecom-market-end-of-2015
[2] Kakihara M. Mobile Apps in APAC: 2016 Report [Internet]. Google; c2016 [cited at 2017 Mar 13]. Available from: http://apac.thinkwithgoogle.com/articles/mobile-apps-in-apac-2016-report.html
[3] Sherry JM, Ratzan SC. Measurement and evaluation outcomes for mHealth communication: don't we have an app for that?.
[4] IMS Institute. Patient Adoption of mHealth [Internet]. c2015 [cited at 2017 Mar 15]. Available from: http://www.imshealth.com/en/thought-leadership/quintilesims-institute/reports/patient-adoption-of-mhealth
[5] Aitken M, Gauntlett C. Patient apps for improved healthcare: from novelty to mainstream. Parsippany, NJ: IMS Institute for Healthcare Informatics. 2013 Oct.
[6] Stoyanov SR, Hides L, Kavanagh DJ, Zelenko O, Tjondronegoro D, Mani M. Mobile app rating scale: a new tool for assessing the quality of health mobile apps. JMIR mHealth and uHealth. 2015;3(1):e27.
[7] Hanrahan C, Aungst TD, Cole S. Evaluating Mobile Medical Applications. 2014.
[8] Klonoff DC. The current status of mHealth for diabetes: will it be the next big thing?. Journal of diabetes science and technology. 2013 May 1;7(3):749-58.
[9] Leijdekkers P, Gay V. User adoption of mobile apps for chronic disease management: a case study based on myfitnesscompanion®. InInternational Conference on Smart Homes and Health Telematics 2012 Jun 12 (pp. 42-49). Springer Berlin Heidelberg.
[10] Ruiz IJ, Nagappan M, Adams B, Berger T, Dienst S, Hassan AE. Examining the Rating System Used in Mobile-App Stores. IEEE Software. 2016 Nov;33(6):86-92.
[11] Zhu H, Xiong H, Ge Y, Chen E. Ranking fraud detection for mobile apps: A holistic view. InProceedings of the 22nd ACM international conference on Information & Knowledge Management 2013 Oct 27 (pp. 619-628). ACM.
[12] Kaplowitz MD, Hadlock TD, Levine R. A comparison of web and mail survey response rates. Public opinion quarterly. 2004 Mar 1;68(1):94-101.
[13] Gosling SD, Vazire S, Srivastava S, John OP. Should we trust web-based studies? A comparative analysis of six preconceptions about internet questionnaires. American Psychologist. 2004 Feb;59(2):93.
[14] Dutta-Bergman MJ. Primary sources of health information: Comparisons in the domain of health attitudes, health cognitions, and health behaviors. Health communication. 2004 Jul 1;16(3):273-88.

[15] Cameron D, Harvey A. eHEALS: The eHealth Literacy Scale. J Med Internet Res. 2006;8(4):e27.
[16] Compeau DR, Higgins CA. Computer self-efficacy: Development of a measure and initial test. MIS quarterly. 1995 Jun 1:189-211.
[17] Rusli EM, MacMillan D. Uber gets an uber-valuation [Internet]. Wall Street Journal; c2014 [cited 2017 Mar 31]. Available from: wsj.com/articles/uber-gets-uber-valuation-of-18-2-billion-1402073876
[18] Levine B, Goldschlag D. Can telemedicine boost our ailing healthcare system? [Internet]. Modern Medicine Network; c2015 [cited at 2017 Mar 31]. Available from: http://contemporaryobgyn.modernmedicine.com/contemporary-obgyn/news/can-telemedicine-boost-our-ailing-healthcare-system-1
[19] Fox S, Duggan M. Mobile Health 2012 [Internet]. c2012 [cited at 2017 Mar 21]. Available from: http://www.pewinternet.org/2012/11/08/mobile-health-2012/