

A Qualitative Study of Older Adults' Acceptance of New Functions on Smart Phones and Tablets

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Abstract. This study examined why older adults accepted or rejected new functions and how they made their decision. 44 older adults were asked to use eight functions on two smart phones and two tablets. Then, they were interviewed about their acceptance of functions. They had the lowest acceptance of the microblog function. Finally, older adults reported reasons of accepting or rejecting functions. The result was a model to represent older adults' decision process, which was influenced by eight factors. This decision process generated four major findings. First, substitutes seemed to be a big obstacle to older adults' acceptance of new functions on smart phones and tablets. Second, openness influenced whether older adults stressed the usefulness of a new function. Third, contexts and lifestyles influenced older adults' judgment of usefulness. Fourth, older adults seemed to tolerate some complexity, but it should not be more than they could handle after learning.

Keywords: Older adults, Acceptance, New functions, Smart phones and tablets.

1 Introduction

Tremendous elderly-specific functions on smart phones and tablets provide significant utility, but most older adults are not using these functions. New functions (i.e., functions that older adults never used before) could be intimidating and overly complicated for older adults, because they had a cumbersome experience with feature phones. They had difficulties with the poor readability on small displays, typing on compressed buttons, and navigating in the hierarchical menu. As a result, most older adults only used core functions on feature phones (phone calls and short messages) and dared not to try new functions.

Luckily, many difficulties with feature phones could be solved by smart phones and tablets. Smart phones and tablets have large displays, support finger-based direct input, and no longer have hierarchical menus, thus they would provide a brand new experience for older adults. This might change older adults' perception of mobile phones based on their past experience. With this new perception, older adults might try new functions.

Functions on smart phones and tablets face the competition from substitutes. That is, a function on mobile phones could be replaced by the same function on desktop

computers (e.g. email and web browsing) or specialized products (e.g. GPS navigation devices, e-book readers, and digital frames). Besides, functions on smart phones and tablets also face the competition among themselves. Hundreds of thousands of functions are available on smart phones and tablets, and a new function has to stand out from the crowd to be liked by older adults.

This study aimed to extend older adults' mobile phone usage from core functions to new functions. First, older adults would have an experience of using new functions on smart phones and tablets. Then, this study examined why older adults accepted or rejected these functions and how they made their decision.

2 Literature Review

2.1 Older Adults' Acceptance of Mobile Phones

Two factors that influence people's acceptance of information technology are perceived ease of use and perceived usefulness [1]. However, older adults had lower perceived usefulness and lower perceived ease of use than younger adults [2].

New technology's usefulness and ease of use are not equally important for older adults. Some older adults perceived usefulness more important than ease of use. That is, they would accept a useful device even if it was difficult to use. Melenhorst and Rogers [3] found that benefits were more influential than costs (e.g. effort, lack of skills, expenses) on older adults' intention to use email. This could be explained older adults' decision process proposed by Fisk et al. [4]: older adults first judged the usefulness and then disadvantages of a new technology. Only when its usefulness outweighed disadvantages, older adults would accept it.

Apart from perceived ease of use and perceived usefulness, ease of learning also influences older adult's intention to use mobile phones. Older adults had difficulty in learning how to use mobile phones [5, 6], and they found mobile phones more difficult to learn than younger adults [7].

Previous studies investigated older adults' use of two functions which usually involved little text entry: route navigation and web browsing. As to the navigation function, Goodman et al. [8] investigated different modalities to present the information of landmarks on mobile phones. As to the web browsing function on mobile phones, new design of web pages was proposed for older adults [9].

Older adults made many errors during text entry on mobile phones, no matter they used typing [10] or handwriting [11]. These problems influenced the use of functions requiring text entry. One typical example is the medication adherence application. It turned out to be difficult to use because it needed older adults to enter the text of medication information [6, 12].

3 Methodology

The first phase of this study is actual use of smart phones and tablets for about 50 minutes. During this period, the instructor trained participants and then asked them to use functions independently. In the second phase, participants were interviewed about their acceptance of functions, and reasons for accepting or rejecting functions.

This study included actual use of functions for two reasons. First, actual use of mobile phones influenced older adults' perceived ease of use and perceived usefulness [2]. Second, many older adults' mental model of functions which was formed through their experience with feature phones may be out of date [13].

Four touch-screen smart phones and tablets were used (shown in Figure 1): Apple iPod Touch (3.5", iOS), Dell Streak (5", Android), Samsung Galaxy Tab (7", Android), and Apple iPad (9.7", iOS). The order to use four devices was counterbalanced. The brands on the four devices were covered with a masking tape. Two camcorders were used: one at the upper right side of participants and the other one directly above the display.

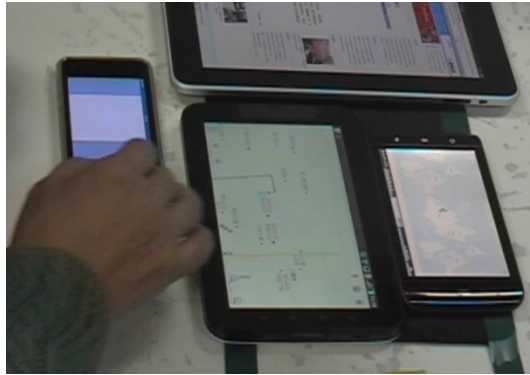


Fig. 1. Two smart phones and two tablets

Finger-based input usually involved four actions: tapping buttons, pinch zooming, tapping on-screen keyboards, and handwriting. The former two actions were used in study 1, and the latter two actions were used in study 2.

3.1 Study 1: Use of Functions without Text Entry

12 older adults (Mean age=66.4; SD=5.6; Range=59-77) participated in the first study. They were randomly divided into four groups. They used four functions on smart phones and tablets: photo album, document reader, Google map, and web browsing (shown in Figure 2). The photo album function and the Google map function are iOS's own and Android's own functions, and the other two functions are the document reader (Office Suite in Android, the default PDF reader in iOS), and the web browsing (Internet Explorer in Android, and Safari in iOS).

In order to make participants experience gesture input, the content on the photo/document/map/web page was set at a small size. Participants zoomed in to view the content. To check whether they read the content carefully, the cloze test was conducted. Participants wrote down answers on a piece of paper. Each participant used two ways of zooming in/out: pinch zooming and tapping the zooming in/out buttons.

- Task 1: Browse the album. Zoom in each photo and write down the predefined digit on the photo.
- Task 2: Read the document. Zoom in each page and write down the missing words.

- Task 3: Plan the route. Zoom in the map to find the destination and write down the route to the destination.
- Task 4: Browse web pages. Zoom in predefined web pages, read the content, and write down the missing words.

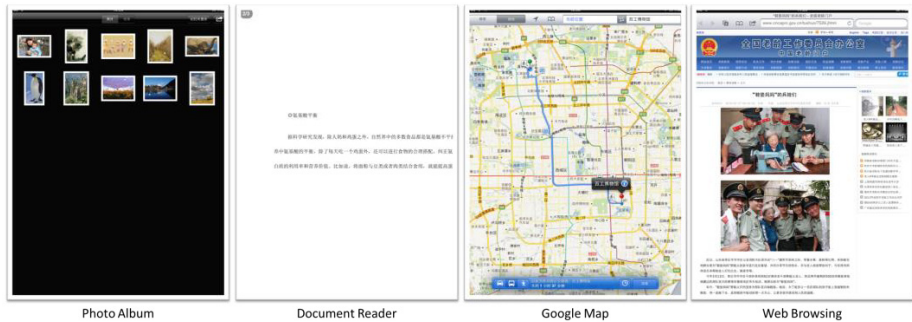


Fig. 2. Sample screen shots of four functions in study 1

3.2 Study 2: Use of Functions Requiring Text Entry

32 older adults (Mean age=67.2; SD=5.53; Range=60-79) participated in the second study. They were randomly divided into four groups. They used four functions: contacts, microblog, Google search, and email (shown in Figure 3). The contacts function and the email function are iOS's own and Android's own functions, and the other two functions are Sina Microblog (China's version of Twitter) and Google Search widget/application.

In order to make participants experience text entry, they were asked to enter a short sentence including Chinese characters, digits, and punctuation. Each participant either used handwriting or typing on the on-screen keyboard.

- Task 1: Create a new entry in the contact function.
- Task 2: Post a message in Sina Microblog
- Task 3: Search keywords in Google Search
- Task 4: Send an email to a predefined contact



Fig. 3. Sample screen shots of four functions in study 2

4 Results and Discussion

4.1 Acceptance of Functions

Taking all the eight functions together, the photo album was participants' favourite function, as shown in Figure 4. This is supported by previous finding that older adults liked taking and viewing photos [14, 15].

Microblog was participants' least desirable function among eight functions. consistent with previous studies, older adults did not accept socializing through Internet, so their initial perception of social media was strongly negative [16]. Most participants did not like the microblog for four main reasons: (1) they did not want to expose themselves, (2) they preferred email, phone calls, or short messages rather than the microblog to keep in touch with friends, (3) they preferred to meet other people in person. (4) they did not want to make new friends. Instead, they wanted to keep in-depth communication with old friends. And they thought the constraints on the number of words made the microblog not suitable for in-depth communication.

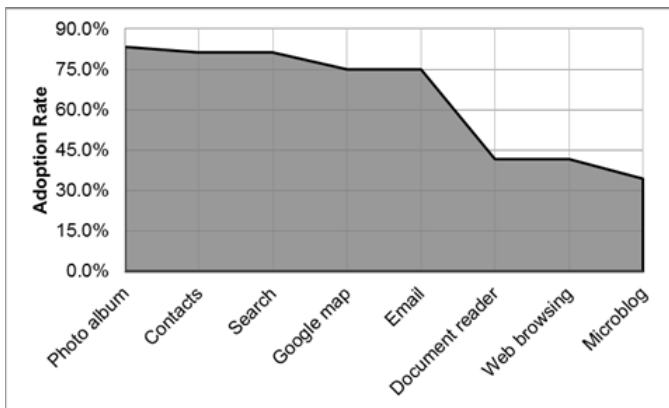


Fig. 4. Adoption rate of eight functions

4.2 Factors Influencing Older Adults' Acceptance of New Functions

Based on the results of the interview, a flow chart is proposed to represent older adults' decision process about accepting or rejecting a new function (shown in Figure 5). This process is influenced by eight factors, which are introduced one by one in the following section.

Social Influence

Participants tended to try a new function if their family or friends recommended it. They wanted to maintain ties to family and friends. Besides, family members bought mobile phones for participants and urged them to use certain functions. This is consistent with previous studies, which reported that older adults were under social pressure to adopt mobile phones [17]. Nine participants indicated that they would explore a new function under social influence. Apart from this, sometimes using new functions might be mandatory work requirements.

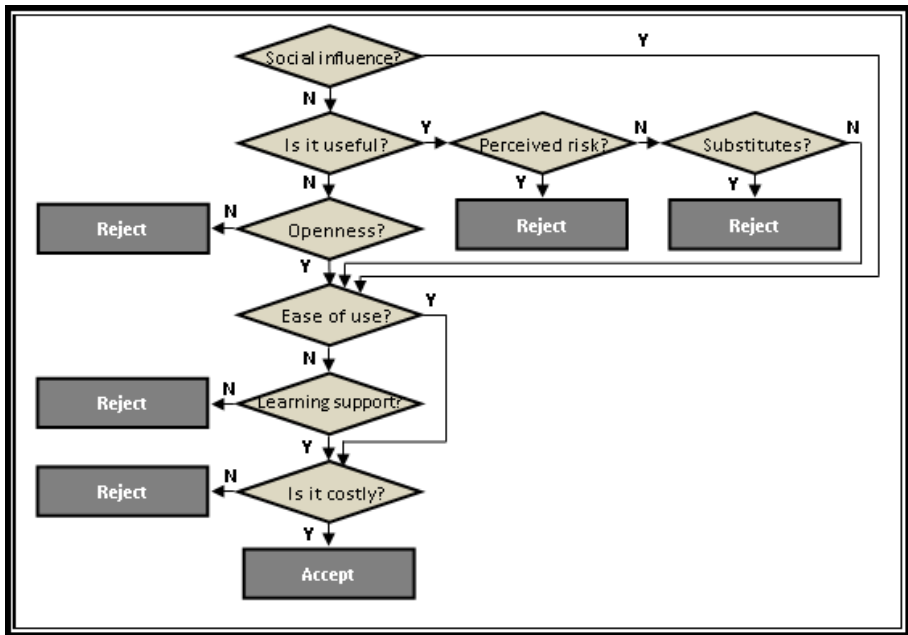


Fig. 5. Participants' decision process of accepting or rejecting a new function

Perceived Usefulness

Participants judged usefulness in different ways. Some participants held that a function was useful if it could help activities in the real world. Particularly, functions on mobile phones were perceived useful if they could help older adults out in emergency [5]. In contrast, other participants held that a useful function did not need to be practicable. Instead, it could just make people feel good. This is similar to the finding that older adults would accept enjoyable information technology [14].

Perceived usefulness was influenced by contexts and lifestyles. Different contexts blurred the line between acceptance and rejection. Participants rejected a function on smart phones and tablets for usage at home, but they accepted it when they went out or when an emergency happened. This influence of contexts was reported by ten participants. Besides, older adults' lifestyle influences their acceptance. Participants who often went out and traveled around seemed to be willing to use Google map, and those who did not have the habit of reading books and newspapers were reluctant to use the document reader function and the web browsing function.

Perceived Risk

After knowing the usefulness of a new function, participants evaluated its disadvantages. Participants were also afraid that they might break the devices or the devices might get lost or robbed. However, the major risk was about the invasion of privacy. Participants felt it not safe to expose themselves through Internet. This is not surprising, because older adults were cautious to give private information. Their privacy

concern was so strong that it became the most important reason for rejecting social media [16]. Only when the usefulness outweighed privacy concern would older adults consider a new function.

Substitutes

Many functions on smart phones faced the competition from substitutable devices and substitutable activities. 11 participants in this study rejected new functions because of substitutes. They would use the web browsing/search/email function on desktop computers rather than on smart phones and tablets, use digital cameras/camcorders rather than smart phones and tablets. Similarly, these participants also stuck to their routine activities. They preferred watching TV/reading books/newspapers rather than reading on smart phones and tablets, and preferred meeting people in person/calling people rather than contacting people through Internet. The influence of substitutes on older adults' acceptance is ignored by previous studies.

Openness

Some participants would like to try a new function even if it was not useful. Their personality made them open to new things. They would decide to accept or reject a new function after they tried it. Three participants reported that they enjoyed exploration as long as there were new functions. This is backed up by previous studies. Korzaan & Boswell [18] also found that individuals who rated high on openness were also more willing to experience new technology.

Ease of Use

Participants would like to consider functions which were easy to use. However, difficult-to-use functions were not necessarily rejected. Some participants reported that they were willing to learn to use difficult-to-use functions as long as functions were very helpful. The influence of ease of use was mentioned by 13 participants.

Participants usually judged ease of use from three aspects. First, 10 participants perceived that large displays, big fonts, and sufficient contrast represented easy output. They did not want to carry around eye glasses to read too small text, and they also did not want to scroll to read too large text. They desired the size that is just right. Second, some participants perceived that a small number of functions represented ease of use. Older adults had great difficulties with the broad and deep hierarchical menu of feature phones, so less functions was believed to be the solution. However, limited functions may drop sales of mobile phones. When people choose from two devices at the same price, they usually buy the one with more functions [13]. Third, some participants perceived that handwriting and voice input represented easy input. It should be noted handwriting and voice input might also cause new problems [13].

Learning Support

Ten participants stressed the importance of getting help from other people. They felt scared if nobody helped them with problems during learning. Most of them would like family members to teach them. However, some participants refused to ask help from younger people, because younger people did not express in the way understood by older adults. Previous studies reported that older adults learned mobile phones mainly from two sources: manuals and other people. Since manuals were difficult to understand [19], older adults usually turned to other people for help. The importance

of support is also stressed by Wang et al. [14], who found that support availability influenced older adults' acceptance of information technology.

Cost

13 participants reported they would consider the cost of using a new function. Since many functions on smart phones and tablets needed Internet access, older adults cared about how much it would cost. Some participants rejected functions as long as there was Internet access fee, while other participants compared the fees between mobile phones with other substitutes and then chose the cheaper one. The influence of cost was not included in older adults' acceptance models.

5 Conclusion

This study analyzed older adults' decision process of accepting or rejecting new functions on smart phones and tablets. New acceptance factors (i.e. substitutes and openness) were discovered, and the understanding of well-documented acceptance factors was enriched. Results of this study could not only help improve the quality of life for older adults, but also help practitioners promote new functions to increase public acceptance and market share.

There was a big gap in participants' acceptance of functions on smart phones and tablets. Participants had high acceptance of functions that were needed in frequent activities (e.g. photo album, contacts, and email) or in infrequent but emergent activities (e.g. Google search and Google map). However, most participants were reluctant to read small text on smart phones and tablets, and they were not ready to socialize through Internet and preferred traditional social ways (e.g. meeting in person, calling, SMS).

The difference in participants' acceptance could be explained by their decision process, which was influenced by eight factors: social influence, perceived usefulness, perceived risk, substitutes, openness, perceived ease of use, learning support, and cost. This decision process generates four major findings. Accordingly, implications for improving acceptance of new functions on smart phones and tablets are identified.

First, substitutes seemed to be a big obstacle to older adults' acceptance of new functions on smart phones and tablets. This implies that knowing what a new function can do is not enough for older adults. Instead, knowing what smart phones and tablets can do but substitutes cannot do may be more important.

Second, openness influenced whether or not older adults stressed the usefulness of a new function. This implies that persuading different older adults to use new functions needs different strategies: stressing enjoyment for open-minded older adults while stressing usefulness for others.

Third, contexts and lifestyles influenced older adults' judgment of usefulness. This implies that a deep understanding of older adults' daily life is needed. Based on that, dividing older adults into groups of individuals would help practitioners find out what is really useful for a group of older adults.

Fourth, older adults seemed to tolerate some complexity, but it should not be more than they could handle after learning. This implies that if a new function is not easy to use, practitioners should first stress its usefulness to trigger older adults' learning motivation and then provide learning support.

Three limitations should be noted when generalizing the results. First, the sample in this study was a sample of convenience, which may not well represent the older population. Second, text in study 2 was Chinese characters, so the results might be not applicable to other languages. Third, participants had short-time exposure (50 minutes) to new functions.

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