
Integrated Model Based on the Psychology of Active/Non-active Computer Users: Activating Technology Holdouts

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Abstract

Although many Internet-based social services exist that can raise our quality of life, there are still many non-active users who cannot fully enjoy the convenience of the computer and its functionality even though they have computers in the home. In order to analyze how to enhance computer usage, we conducted a field study and arrived at an integrated model that enables us to deeply understand the psychology of active/non-active computer users. Initial design guidelines for activating the non-active users are derived from our model.

Keywords

Home computing, computer adoption, qualitative methods

ACM Classification Keywords

H1.0. Models and principles: General; H5.2. Information interfaces and presentation (e.g., HCI): User Interfaces.

General Terms

Design, human factors, theory

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Introduction

Although the number of the people who possess computers continues to increase, there are still many non-active users who cannot fully enjoy the convenience and functionality [6]. As more and more home appliances are connected to the network, it has become more critical to ensure that non-active users are not left behind.

Our challenge is to activate the non-active computer users. Here we acknowledge that each user has a different definition of what constitutes "sufficient" activity that depends on his/her environment or life style. Therefore, activeness in terms of computer usage is, in this paper, defined as "the degree of how fully each person utilizes computers from the viewpoint of his/her own life style". This definition avoids the simple metric of frequency of use.

It is known that computer usage at home is generally restricted to just a few "favorite" applications. According to Beauvisage [2], the five most used applications by an individual occupy 83% of his PC usage time on average. He also indicated that when there are two computer users in a household, the most active one consumes 83% of the computer usage time on average [2]. These results show that having a computer at home does not necessarily imply that everyone uses it equally. Our study focuses on the reasons for these differences.

In order to analyze how to enhance computer usage, we conducted a field study to understand the psychology of active/non-active users. Looking at computer usage from the perspective of user psychology brings a deep understanding of users. In

this paper, we present the initial design guidelines derived from our newly proposed model that are intended to activate non-active users.

Field Study

We conducted extensive semi-structured interviews each of which lasted 1.5 to 2.8 hours. We asked each participant about their computer experience; when and why they started to use computers, how they learned to use them, and what application software they used. Further, we also asked about their lifestyle (e.g. their work, hobbies) and about the usage of other home appliances (e.g. TV, digital camera). Home tours provided us with additional details about the environments in which the computers were used.

We interviewed 32 occupants of 17 households in Japan; both husband (M01~M15) and wife (F01~F15) in 15 households and only the husbands in 2 households (M16, M17). They all had broadband Internet access, were in their 30's to 60's, and none worked at information technology or telecommunication companies. We recruited them via the web site of a survey company and mailing list of a provider service. Each family was paid to participate in the study.

Data Analysis

We adopted a method based on the Grounded Theory Approach [7] for the analysis, which allowed us to draw bottom-up conclusions. In the first step, all interviews, totaling 39 hours and 19 minutes, were transcribed yielding 764,172 Japanese characters. In the second step, we conducted open coding, with the aim of identifying key themes in the data without imposing pre-conceived categories. This process resulted in about 50 codes. In the third step, the initial set of the

phenomena described by the open codes were compared against each other to group them into categories. This process makes explicit the connections between categories and sub-categories. The final step, selective coding, is the process of identifying the core category and then systematically relating it to the other categories. This involves validating the relationships between those categories and refining them. We continued these steps until we reached 'theoretical saturation', the point at which we thought we could learn nothing new and relevant. These procedures resulted in a set of 12 main categories (8 psychological factors, and 4 external factors).

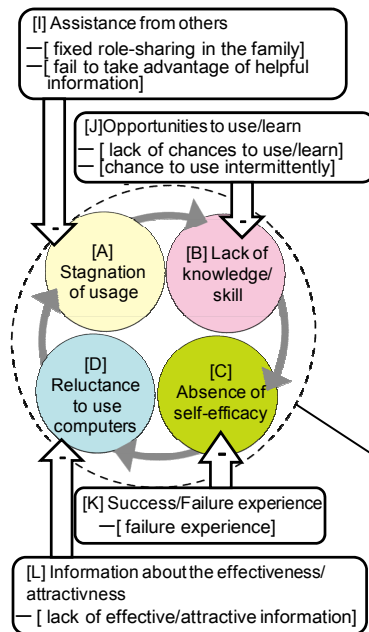


figure 2. Negative Loop of non-active users; the bottom side of the cylinder of Fig.1 External factors negatively effect on the loop.

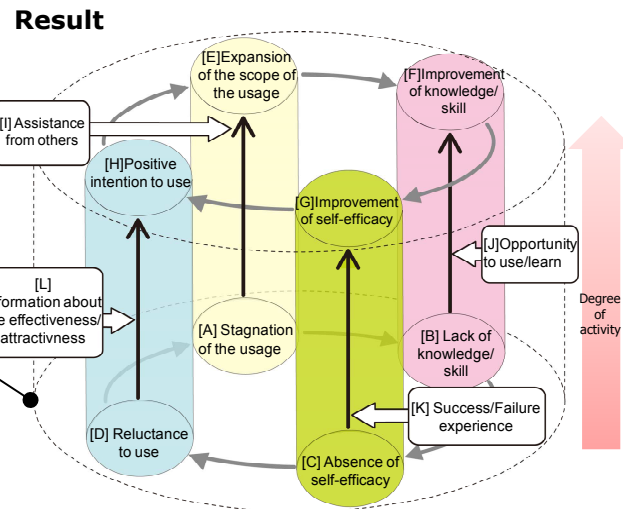


figure 1: Integrated model depicting the psychology of the active/non-active users.

Fig.1 presents our proposed user model; it consists of a negative loop on the bottom and a positive loop at the top. The vertical axis of the cylinder represents the

degree of activity. The reason why non-active users won't actively use computers is because they are stuck in the negative loop on the bottom of the cylinder ([A]-[D]). In addition to the negative chained factors, the external factors ([I] - [L]) further suppressed their usage in most cases. The active users, on the other hand, accumulate experiences and positive motivation by traversing the positive loop ([E] to [H]) where external factors ([I] to [L]) reinforce the loop. Each loop and the effects of the external factors are described in detail below. Each external factor consists of subcategories that have either positive or negative effects as described in Fig.2 and Fig.3.

Non-Active Users

The negative loop of the non-active users is detailed in Fig.2. "[A] Stagnation of usage" means that the non-active user restricts her/himself to only a very limited range of tasks. "[I] Assistance from others" reinforces the stagnation of the non-active users. For those people, resolving troubles or trying new operations are the job for other members of the family ("fixed role-sharing in the family"), and when others give support, the non-active users "fail to take advantage of helpful information". For example, F01 stated, "Oh, I can only use for very very basic things. Shopping.. I suppose, just once or twice a week". When she was asked of her digital camera usage, she answered, "My husband does it, putting them in my computer.. I mean, I make him do it.(snip) I guess it's kind of enough to have one person in a family who can take care of it". The role of assistance at home found in this study is consistent with the previous study which indicated that families tend to throw up "gurus" that can deal with the computers in the house [5],[6].

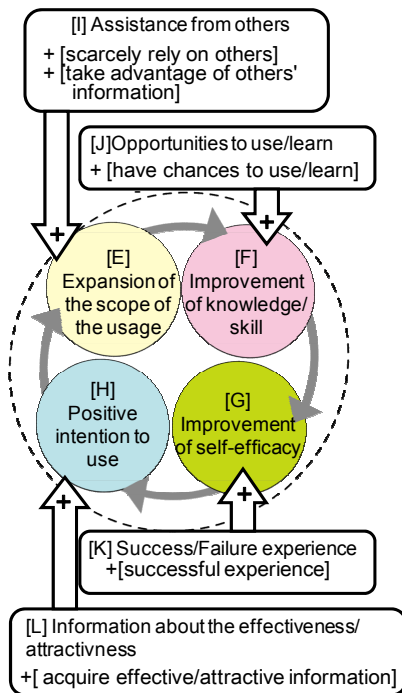


figure 3. Positive Loop of active users; the top side of the cylinder of Fig.1 The external factors positively effects on the loop.

Not trying to do new things by oneself leads to “[B] Lack of knowledge/skill”. “[J] Opportunities to use/learn” also negatively impact “[B] Lack of knowledge/skill”; they have “few and intermittent chances to use/learn” computers. For example, F02 stated “*I only sit in front of the computer when I’m alone at home, often in the morning. (snip) I sometimes put it on, but often I don’t, because my husband occupies the computer when he returns*”. The non-active users tend to have lower priority in terms of computer usage at home, and this also restricts the opportunities.

“[B] Lack of knowledge/skill” reinforces “[C] Absence of self-efficacy”, which refers to one’s perceived abilities to perform a specific activity [1] possibly with the fear of causing the computer system to fail. “[K] Failure experience” also reinforces [C]. For example, F01 who often relies on her husband stated “*I’m not good at using computers. (snip) It’s kind of my character to break things*”. Her inability to understand the manual, kept her away from it; “*Oh, I couldn’t, that manual, oh no, I just can’t. At the very beginning, I got stuck.. (snip) I’ve never even touch them since then.*”

“[C] Absence of self-efficacy” then reduces the user’s interest and intention to use computers, which is described as “[D] Reluctance to use computers”. “Lack of attractive/effective information” ([L]) is also a reason for “[D] Reluctance to use computers”. For example, one of the non-active users (F03) stated, “*I don’t have any motivations like, ‘I wanna do more’, or ‘I’m gonna do something’. (snip) Well, and if he (her husband) told me like, ‘let’s do something because it’s slow’, and then I’d say ‘If you say so, OK, go head, do it’*”. Her friends

were also not interested in computers, and so she received no attractive information from them.

“[D] Reluctance to use computers” again negatively impacts the “[A] Stagnation of usage”. In this way, both chained factors and the external factors make it difficult for the non-active user to become an active user.

Active users

The factors in the positive loop of the active user ([E] to [H]) are the inverse of the negative factors mentioned above; this is detailed in Fig3.

“[E] Expansion of the scope of the usage” indicates that the active users used a broad scope when tackling problems created by something new. “[I] Assistance from others” reinforces the further expansion of computer usage. In detail, active users “scarcely rely on others”, and/or they “take advantage of others’ information” when they ask for help. For example, M01 who is an active user stated, “*I have some friends who can answer my questions. If I can’t do something by myself and call them, they’ll solve the problem, but I want to learn by myself, so I try to learn from them. Ask them and do it by myself.*”

“[E] Expansion of the scope of usage” then brings “[F] improvement of knowledge/skill”, and the “[I] opportunities to use/learn” computers further reinforces the improvement. They “have chances to use/learn” in their life such as during their work.

In this way, active users gain skill and motivation while traversing the positive loop.

The integrated model

Our integrated model connects non-active users and active users (Fig.1). The impact of the external factors depends on the activity level; the lower the level is, the more the negative effect is reinforced while the positive effect is weakened. This implies that even if non-active and active users were presented with the same opportunity, their perceptions of the opportunity would differ. For example, an active user (M02) stated that he had never had any troubles that he could not solve by himself, even though that he had the experience of contacting a call-center. He concluded that the problem was "successfully" solved, because he understood what had happened, and the reason for the troubles. A non-active user (F04), on the other hand, concluded that she "failed" in solving those problems because she *had to* ask others, which created the strong impression that she *couldn't* do it by herself, rather than that she *could* solve the problem with the call-center.

Developing Design Guidelines

As mentioned above, we found that external factors affect the psychological factors either positively or negatively. Thus, they are key to designing guidelines for activating computer usage. That is, the external factors should be carefully designed to move the psychological factors from the bottom of the cylinder to the top. In addition, it is essential to take into consideration other psychological factors in the same negative loop when providing the external factors. The guidelines are described in the following.

Escape from "[A]stagnation of usage"

To escape from the "[A] stagnation of usage", the information provided by others ([I]) must be carefully structured to expand computer usage by helping the

non-active user with her/his task. "[A] stagnation of usage" is also heavily impacted by "[D] reluctance to use" computers, so it is also important that the assistance ([I]) take [D] into consideration. One solution that could be implemented by call-center support, for example, is telling non-active users not only how but also why they should conduct trial-and-error operations.

Escape from "[B] lack of knowledge/skill"

In order to escape from the "lack of knowledge/skill ([B])", it should be essential to create opportunities to use/learn ([J]) considering that non-active users have limited scope of usage ([A]). Opportunities that suit the user's situation/task would enhance the value of the information to the user, which would weaken the effect of the "[A] stagnation of usage".

Escape from "[C] Absence of self-efficacy"

To elevate "[C] Absence of self-efficacy" to "[G] Improvement in self-efficacy", "[K] Successful experience" plays a key role (e.g. providing a series of easy tasks). Considering that non-active users lack knowledge/skill ([B]), it would be helpful to carefully design instructions that do not discourage users even if they fail (e.g. warning messages should not explicitly use the term "error").

Escape from "[D] Reluctance to use"

To escape from "[D] reluctance to use" computers, providing information on their effectiveness/attractiveness ([L]) is the key. The solution is to break the negative pressure of "[C] Absence of self-efficacy". For example, the information should emphasize that anyone can enjoy an attractive new service because it is so simple. The non-active

user will perceive that her/his capabilities may actually be sufficient to use the service, which weakens [C].

Holistic Approach to Non-active Users

We have described the ways in which computer usage can be activated based on the proposed model. Although our model covers most of the major factors derived from the empirical study, we note that our model is an approximation. In particular, the factors are almost certainly not discrete entities. The external factors are also not independent and in some cases, one event may reinforce all of the psychological factors. For example, an opportunity to use the computer may provide the information for improving the skill ([J]), which could help the user notice the effectiveness/attractiveness ([L]) of the application. In addition, assistance from others ([I]) may be given by the opportunity, and the successful/failure experience ([K]) could be the result of the opportunity.

When designing services, considering all the factors described in our proposed model would significantly facilitate the activation of the computer usage of non-active users. Our model is applicable to not only the services for computers, but also for other home appliances. The service planners/providers, call-center managers and operators, or even the assisters at home can benefit from using this model. We will continue our work by applying the model to actual ICT services, validating and refining our proposed model together with identifying new guidelines and refining the ones presented here.

Conclusions

We have developed an integrated model of active/non-active computer users based on an empirical study. Our

model, which is based on empirical data collected from actual Japanese families, covers the key factors, and leads to a deep understanding of non-active users. Some of the factors that enhance computer usage have been given in previous studies [1],[3]-[6] but up to now no integrated explanation has been proposed. To activate non-active users, solutions based on the external factors with consideration of the negative loop identified here are crucial. We have developed initial design guidelines based on the proposed model. We will continue our work by iterating the cycle of validation and model-refinement. We believe that our findings provide effective insights on how to activate users.

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