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# Understanding the Impact of Service Trials on Privacy Disclosure

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**Abstract.** We have many opportunities to disclose privacy information in exchange for convenient services. In the context of privacy calculus, numerous research studies have been conducted to date on the relation between potential benefits and potential risks of privacy disclosure decisions[1][2]. However, an unresolved problem in the privacy calculus is that the intention of the privacy disclosure may vary not only between users but also in a single user. Our study hypothesized that each user always makes a decision on privacy disclosure depending on the user experience of the service in use. Therefore, we take a user-centered perspective to investigate the impact of service trials on users' privacy disclosure decisions. In this study, a task-based study scenario has designed and tested between lab members. Result of investigation, we find if the service makes users have a good impression after service trials, users tend to provide more privacy disclose.

**Keywords:** privacy disclosure · user experience · user-centered perspective

## 1 INTRODUCTION

Privacy is becoming essential for current services. Service providers must elaborate on advertising activities such as commercials and SNS to encourage users to disclose privacy information. Service trials are one such advertising activity. Service trials can ease use of the service by providing free or half-fare.

Privacy disclosure has traditionally been well studied in the field of privacy calculus[1-5]. For example, Malhotra et al. developed a scale for internet users' information privacy concerns (IUIPC)[1]. They also showed the relationship between IUIPC and behavioral intention toward releasing personal information at the request of a marketer. Furthermore, Li et al. stated that exchange benefits, in particular perceived usefulness, have a positive effect on the intention to reveal privacy[2]. Many similar studies indicate that privacy calculus can measure user thoughts on privacy disclosure.

However, it is not easy for service providers, especially while they are developing a service, to understand the intention of a user's privacy disclosure.

Moreover, we think that an unresolved problem in privacy calculus is that the intention of privacy disclosure may vary not only between users but also for a single user. The objective of our study is to understand the impact of service trials on privacy disclosure and to determine what factors during service trials affect user privacy disclosures.

In our study, we focus on user experience (UX) obtained through service trials. Additionally, we believe that if users gain a better UX through the service trials, users may disclose more privacy in return. In other words, if service providers and users obtain good consensus through service trials, users may perform appropriate privacy disclosures. In particular, we designed a task-based study scenario and tested it between lab members. The scenario consists of tasks to request users to install and try Android apps. We analyzed the behavioral intentions of privacy disclosure before and after service trials using standardized scales and semi-structured interviews.

Our main contribution is introducing the concept of service trials in the context of privacy calculus and empirically examine the effect of service trials with lab study. They reflected our participants' expectations in trial tasks for privacy disclosure and can be used as a good starting point to think about the user-centric design of trial tasks for privacy disclosure.

## 2 QUESTION AND HYPOTHESES

The research questions pertaining to our paper are as follows:

- [RQ1] What is the impact of service trials on the privacy disclosures of users?
- [RQ2] What types of users could be affected by service trials and by disclosing privacy?
- [RQ3] What factors are affecting users during service trials?

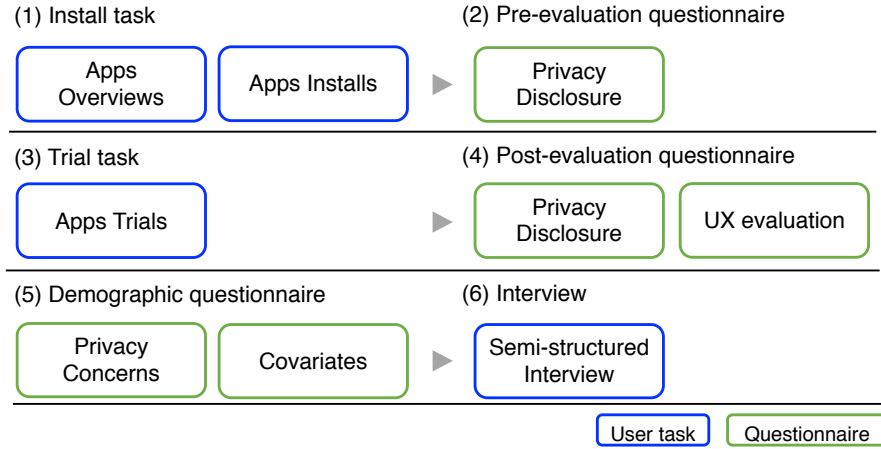
We constructed hypotheses for the above questions as follows:

- [H1] Better user experiences gained through service trials have a positive impact on the willingness to provide privacy to apps.
- [H2] The more privacy concerns users have, the less likely users are to be affected by service trials.
- [H3] Privacy concerns and UX are related to privacy disclosure.

Based on the user study with trial tasks and their responses in a pre-survey and post-survey, we address each of these questions.

## 3 METHODS

We conducted a lab study to test the hypotheses described in Section 2. The Android app used for our study is discussed in detail along with the tasks we asked for the participants to perform.



**Fig. 1.** Conceptual overview of our experimental study scenario

### 3.1 Study Design

**Participants** We had 18 participants; 13 were male and 5 were female, with a mean age of 22(Std.Dev = 1.3 years). The participants who took part in our study were recruited from our university. We explained the purpose of the study, then, for all cases, participants’ consent was obtained.

**Scenario** Fig. 1. presents the conceptual overview of our experimental study scenario. The sessions were split into two tasks, three questionnaires, and semi-structured interview:

1. **Install task:** Participants read the overviews of the apps and installed them.
2. **Pre-evaluation questionnaire:** Participants recorded their behavioral intention (BI) of privacy disclosure for each app in the questionnaire.
3. **Trial task:** Participants try each app.
4. **Post-evaluation questionnaire:** Participants recorded their BI of privacy disclosure and UX in the questionnaire.
5. **Demographic questionnaire:** Participants recorded their privacy concerns and covariates in the questionnaire.
6. **Interview:** A semi-structured interview was conducted.

During the install task, we instructed participants to read the app’s features and privacy policy. We used the same questionnaire to measure the BI of privacy disclosure in pre and post evaluation.

**Apps** We selected four apps from the Google Play Store during the trial task. We selected apps considering the following four conditions: 1) “*apps’ overviews and privacy policy were written by Japanese*” since almost participants consist of

Japanese, 2) “*apps that are likely to be unknown to our participants*” to observe the effect of the trial task more explicitly, 3) “*apps that can be used by everyone*” to observe the effect of gender and age, 4) “*apps that have unique features*” to observe order effect. After considering these conditions, we selected four apps from Google Play Store—*recipe*<sup>1</sup>, *translator*<sup>2</sup>, *calendar*<sup>3</sup> and *game*<sup>4</sup>—based on their privacy concerns and UX.

**Questionnaire** We generated the questionnaire using LimeSurvey<sup>5</sup>. All responses were measured on a seven-point Likert scale with anchors in the range from “Strongly Disagree” to “Strongly Agree”. The numerical values are shown together, such as “Strongly Disagree (1)”, to maintain the scale interval between participants constant. Therefore, the Likert scale is treated as an interval scale in our analysis.

### 3.2 Measures

**Behavior Intention** For our study, we requested participants to record their BI of privacy disclosure to capture their attitude toward perusing the overview of an app and attitude toward trying the app. We use an existing scale used in the Malhotra et al.’s study[1].

**User Experience** We used a standardized questionnaire as a measure of UX: User Experience Questionnaire (UEQ, [6]). The UEQ measures overall attractiveness as well as pragmatic (instrumental) and hedonic (non-instrumental) qualities of experience. The pragmatic qualities subscales include perspicuity, dependability, and efficiency. The hedonic qualities include stimulation and novelty subscales. The items are presented in the format of 26 contrasted pairs of words separated by a seven-points scale (ranging from -3 to 3) as exemplified here.

**Privacy Concerns** We assumed the privacy concerns will have a negative impact on privacy disclosure. Therefore, we investigate the privacy concerns of a user using IUIPC proposed by Malhotra et al.[1].

**Semi-structured interviews** To better assess the factors that lead to the variations in consciousness before and after trying apps, we opted for semi-structured interviews. The questions in the interview were pertaining to the

<sup>1</sup> “Delish Kitchen,” [play.google.com/store/apps/details?id=tv.every.delishkitchen](https://play.google.com/store/apps/details?id=tv.every.delishkitchen)

<sup>2</sup> “Microsoft Translator,”

[play.google.com/store/apps/details?id=com.microsoft.translator](https://play.google.com/store/apps/details?id=com.microsoft.translator)

<sup>3</sup> “Palu - Shared Handwriting Calendar -,”

[play.google.com/store/apps/details?id=com.metamoji.palu](https://play.google.com/store/apps/details?id=com.metamoji.palu)

<sup>4</sup> “Kuukiyomi 2,” [play.google.com/store/apps/details?id=com.fty.kuukiyomi](https://play.google.com/store/apps/details?id=com.fty.kuukiyomi)

<sup>5</sup> “LimeSurvey,” <https://www.limesurvey.org>

	Increased		Unchanged		Decreased	
	M	SD	M	SD	M	SD
Recipe	1.17	0.49	-0.13	1.16	0.77	0.50
Translator	1.27	0.68	0.64	2.64	0.49	0.85
Calendar	0.78	0.49	0.38	0.48	-0.15	0.47
Game	0.72	1.06	-0.63	1.21	-0.79	0.96

**Table 1.** Summary of the response for UEQ

impression before and after trying apps, variations in consciousness before and after trying apps, and privacy concerns on reading the overviews of the apps or trying them. An open discussion was conducted as well, where the participants explained their rationale.

## 4 RESULT AND DISCUSSION

### 4.1 Impact of service trials

With respect to our [RQ1], we analyzed the relationship between privacy disclosure and service trials. We calculated the score of pre and post evaluation BI for each participant. Then, we divided participants into three groups based on the difference between the score of pre and post-evaluation BI. The group in which the difference was positive set as the increased group. Similarly, the group with no difference was the unchanged group, and the group with the negative difference was the decreased group. We calculated the UEQ for each app in each group. Each group scored UEQ with average means of 0.98 (SD = 0.76) for increased group, 0.08 (SD = 0.95) for unchanged group, and 0.06 (SD = 1.23) for decreased group. At the group level, the average means of UEQ was significantly higher in increased group than decreased group ( $t(46) = 3.57$ ,  $p = .00$ ). From this result, we can see that the higher user experiences gained through service trials have a positive impact on the willingness to provide privacy to apps, and the [H1] was supported.

For the further analysis, we show the summary of the UEQ grouped by the difference in BI before and after trial in Table. 1. There were significant differences in the increased group and the decreased group of *calendar* and that of *game* ( $p < .05$ ). On the other hand, there were no significant differences in the increased group and the decreased group of *recipe* and that of *translator*. From the semi-structured interview of *recipe* and *translator*, some participants pointed: “Easy to use. But there are no features I want to use to provide privacy.” and “I gained a good impression, but there’s no need for recommendations, so there’s no need for providing privacy.” Thus, one possible reason could be that the factor that the trade-off between features and privacy did not meet.

	Increased		Unchanged		Decreased	
	M	SD	M	SD	M	SD
Recipe	5.19	0.74	5.44	0.80	5.25	0.88
Translator	5.09	0.76	5.29	0.61	5.36	0.83
Calendar	5.36	0.83	5.66	0.61	5.34	0.61
Game	5.08	1.02	5.39	0.63	5.13	0.82

**Table 2.** Summary of the response for privacy concerns

## 4.2 Impact of privacy concerns

With respect to our [RQ2], we analyzed the relationship between privacy disclosure and privacy concerns. We defined the average of the response of privacy concerns as the score of privacy concerns. Then, we calculated the score of privacy concerns for each app in each group. Table. 2. shows the score of privacy concerns for each app in each group. We found that the unchanged group was the highest score of privacy concerns among the three groups. From this results, we found that participants who have high privacy concern are less likely to be affected by a service trial regardless of the app. Thus, [H2] was supported. In addition, except for *calendar*, the decreased group showed a higher score of privacy concerns than the increased group. This also implies that privacy concerns also have slightly negative impact to the privacy disclosure.

## 4.3 More effective service trial

**UEQ subscales** With respect to our [RQ3], we identified the factor affecting participant during trial. Fig. 2. shows the relationship between BI and UEQ using each UEQ subscale. As shown in Fig. 2., we can see that Attractiveness and Hedonic Quality are significantly strong effect to disclosing privacy. In contrast, Pragmatic Quality does not effect in most cases.

**Interview** From Fig. 2. and the semi-structured interview, we extracted several important factors for disclosing privacy. Positive factor was the users' impression of the trials. The impression of trials is influenced by various factors such as features, usability, interface, privacy policy, and so on. On the other hand, negative factor was roughly categorized to four factors. (1) Not interested in the first place. (2) Did not mind providing privacy for the feature. (3) Permission request is displayed, but I cannot see what it is used for. (4) Too many advertisements. In our analysis on the negative factors, we excluded the factor (1) and (2) since they are unique factors for each participant. Therefore, focus on the remaining two factors. Focusing on the users who had pointed (3), it seems that the access request that the participants were not explicitly informed the purpose of use caused the distrust of the participants. Then, many participants did not allow the privacy request which cannot estimate the corresponding feature in the app. Especially in the *game*, an access request was displayed immediately after

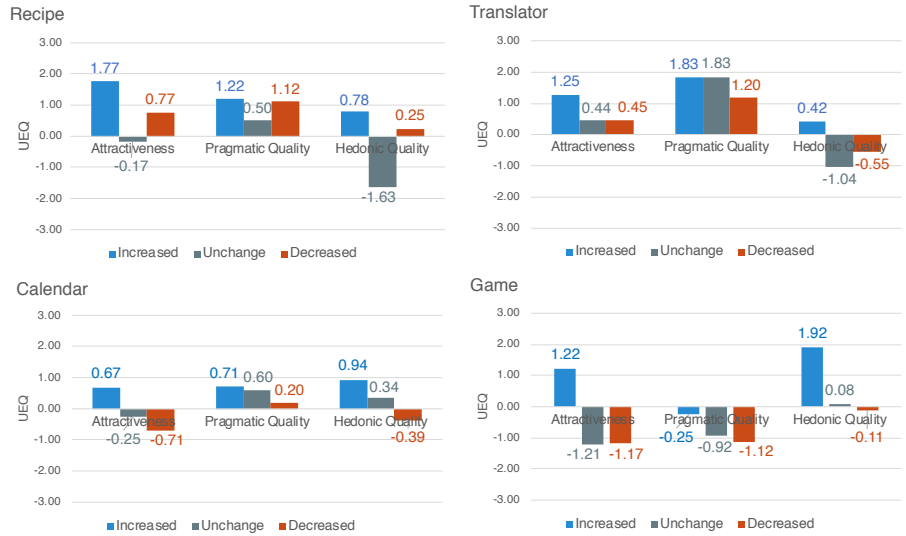


Fig. 2. Result of UEQ grouped by behavioral intention

opening the app. However, after trying the app, they found that the requested privacy was not necessary for the app features. This caused significant decrease of BI. As shown in Fig. 2., we can see that Attractiveness and Pragmatic Quality are significantly small in the decreased group of the *game*. On the other hand, when explaining the purpose of use to the participants who pointed out (3), some users had changed their opinion to disclose privacy. From these results, we can say that when accessing user privacy, service providers may need to indicate the need for access to privacy, as well as specify how the information will be returned to the user.

Also, focusing on the users who had pointed (4), advertising that exceeds the functionality of the app itself will lower the user’s UX and will cause discomfort for the app. If service providers reduced these factors and that eliminated factors hindering user security, users would disclose privacy naturally.

## 5 LIMITATION

We are aware that our research may have limitations. The first is that the participants are students of computer science. Therefore they may stronger security and privacy concerns than the general user. This might cause relatively high privacy concerns scores. The second we could not measure UEQ before installing the app, we subjectively determined whether the impression had been improved. It is plausible that these limitations might have influenced the results obtained.



## 6 CONCLUSION

The present study aims to understand the impact of service trials on privacy disclosure and to determine what factors during service trials affect user privacy disclosures. The study makes two main contributions. First, if the service makes users have a good impression after service trials, users tend to provide more privacy disclose. Second, the study identifies the types of users and factors that impact privacy disclosure. Especially, we have shown that the users' privacy concerns make less likely to be affected by service trials. Also, we found that negative effects on privacy disclosure can be categorized into four. The results of this study are thus promising, and we expect the results to contribute to future studies that investigate to what extent service trials on privacy disclosure can be an enabling factor to UX.

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