

A Questionnaire System with An Authentication Framework Considering Online Activities of Users

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It is difficult to distribute online questionnaire adequately to those subjects who satisfy requirements of investigations. In addition, low questionnaire response rates, because of factors such as overlooking request emails and noncooperation to answer the questionnaires, sometimes annoy the investigators. Now that today's organizational systems adopt a unified authentication framework of which logging function stores authentication records of users in federated systems, the possible solution for these problems arises by utilizing the log data and adding the questionnaire process to the framework. The present paper proposes a flow controlling mechanism arranged in a major unified authentication framework and describes how to utilize log data on the framework to select target persons for questionnaires and increase the response rates.

Keywords: Questionnaires, Shibboleth, Questionnaire response rates

1. Introduction

In universities, students and faculties use various kinds of systems (e.g. an email system and a library system). Usability, visibility and other items are frequently investigated for various reasons such as replacement of the systems. Online questionnaires, distributed with emails directly or web sites, are used widely for the investigations. Target persons for questionnaires should be changed, depending on the investigation purposes. For example, when opinions and impressions of the systems are grasped, it is desirable that persons who have used them become the target persons. However, the use states of the systems are different among persons, and consequently, it is necessary to judge each person and distribute the questionnaires only to the target persons. Furthermore, it seems that questionnaire response rates tend to be low due to factors (e.g. overlooking request emails and noncooperation to answer the questionnaires).

Some studies of the questionnaires to improve the response rates are reported. Keding et al. [1] send short messages as reminders to the target persons. Their findings suggest that the short messages are effective to improve the response rates. Kitagawa et al. [2] develop a questionnaire system which can grasp respondents and nonrespondents. Their experiments show that the response rates improve. However, even if the target persons receive reminders or re-requests by the short messages and other methods, they may not answer the questionnaire because of the factors. In addition, both studies do not propose methods to select the target persons.

The present paper proposes a method of the questionnaires with a unified authentication framework to select the target persons depending on the investigation purposes and to improve the response rates. In particular, (I) the target persons are selected by utilizing log data of the framework, and (II)

a questionnaire screen is displayed only to the target persons after authentication. Our proposal presumes the situation in which the operators of the questionnaires (e.g. persons in information management centers) manage multiple systems and investigate systems by the questionnaires.

2. The Proposal of The Questionnaire Method

2.1 The method to select the target persons

It is considerable that the use states are grasped from (A) user identifiers(=who), (B) used systems(=what), (C) timestamps(=when), (D) client network addresses(=where) and (E) client user agents(=how). The systems record the information, such as uid and timestamps, to their log data. However, it is difficult to apply common procedures for collecting the information of various systems without central logging services. Even if the central logging services are supplied to each system, it is still difficult to unify the data format and the content policy of the systems. Single-Sign-On (SSO) is one of the best solution against such problems. Shibboleth [3] is one of the major framework of inter-organizational SSO, and the present study adopts it. Shibboleth contains an identity provider (IdP), a service provider (SP) and a user agent (UA). The IdP plays a role in both a unified authentication service and a central logging service for the authentication, and the SP provides services to the UA. It is possible to obtain (a) uids, (b) access destinations to the SP, (c) timestamps and (d) IP addresses of access sources from the log data of the IdP. The authentication screen of the IdP is displayed on a web browser of the UA, and the IdP generally uses Apache which records (e) operating systems, browsers and other information to the log data.

A function is provided to select the target persons on the basis of the use states. The operators combine any information from (B) to (E) in the function depending on their investigation purposes. (A) is used to extract the uids of the target persons, according to requirements specified by the operators. (B) is used to select systems among federated systems

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by Shibboleth for deciding investigation targets. If persons have used the systems selected by (B), they become the target persons. (C) is used to select used periods (e.g. from April 1, 2016 to March 31, 2017). (D) is used to select used locations. Since the locations are judged by IP addresses, the operators can select inside or outside of the universities. (E) is used to select used devices (e.g. iPhone and a Windows PC). The operators can select AND or OR condition to each item. For example, if the operators specify “persons who have used the email system and the library system with their iPad from outside of the universities in 2017” as the requirements, uid as the target persons are selected for the questionnaires.

2.2 The method to display the questionnaire screen

To distribute the questionnaires in consideration of the factors is needed to improve the response rates. If the questionnaire screen is displayed not from the emails, without workload of the target persons to obtain their cooperation, it may enhance possibility of answering the questionnaires. The questionnaire screen is therefore displayed forcibly only to the target persons after authentication. In other words, if the target persons access to the systems and their authentication results indicate a success, the questionnaire screen is displayed subsequently. The systems to display the questionnaire screen are selected from (B). Since the questionnaire screen is displayed forcibly, it may be difficult to answer the questionnaires during class and work. To solve this problem, the questionnaire screen includes a skip function.

2.3 System Development

A questionnaire system is built with PHP, HTML and JavaScript. The questionnaire system has functions of making the questionnaires, specifying requirements, distributing the questionnaires and obtaining the results of the questionnaires for the operators. The usage states are collected from the log data of the IdP (idp-process.log) and Apache (ssl_request_log). The questionnaire process is added after the authentication process with FPSP [4], which is a plug-in software of the IdP for access control of the users. FPSP is extended to redirect the access destination of the target persons to the questionnaire system. Figure 1 shows the sequence of the questionnaire method. The blue arrows are original sequence of Shibboleth, and the green arrows are extended sequence. The IdP redirects the access destination of the UA to the SP after the authentication (iii) in the original sequence. In our system, the IdP confirms the UA whether the target persons or not (iv), and only the access destination of the target persons is redirected to the questionnaire system (v). In other words, by adding the questionnaire process to Shibboleth, the questionnaire screen is displayed (vi) only to the target persons selected by requirements after the authentication. Afterwards, the questionnaire system redirects the access destinations of the target persons to the SPs after the end of the questionnaires (vii), and the SPs provide their service to the target persons (viii).

3. A Trial Run of The Questionnaire System

Questionnaires are distributed to target persons by a conventional method and our method, and the response rates are compared to verify effectiveness of our method. One SP in our university is selected as an investigation target. The coverage of the trial run is “ persons who have used the SP in 2015.” The target persons are 14 university students. They are divided into two groups (a control group and an exper-

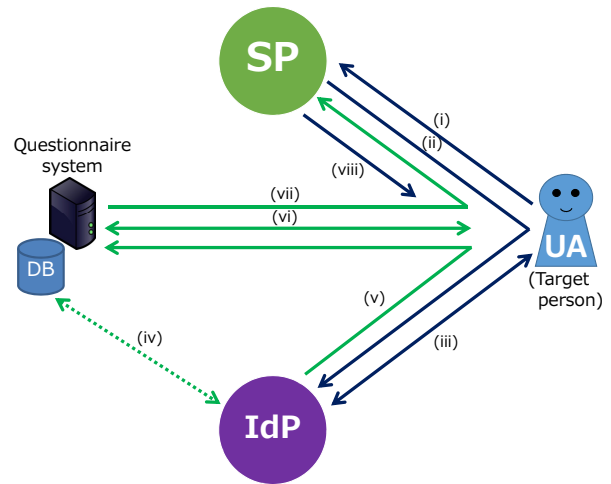


Fig. 1. The sequence of the questionnaire method

imental group), considering usage frequency of the SP. The period of the trial run is one week. The questionnaires are distributed to the control group with emails as the conventional method and the experimental group with our system. The students do not expect to answer the questionnaires because of no previous notice of the questionnaires. The trial run yields the following results: the response rates were 0.14 (the control group) and 0.71 (the experimental group). The response rate of the experimental group was higher than that of the control group, which suggests that there is possibility of effectiveness to improve the response rates with our system. However, one student commented that it had been a little difficult to answer the questionnaires during busy time. It is considerable that to limit the questionnaire time, such as only evening when the target persons may have time to answer the questionnaires, is effective.

4. Conclusion

The present paper proposes the method of questionnaires with Shibboleth. The operators can specify requirements to select the target persons by utilizing log data, and the questionnaire screen is displayed only to them after authentication. The results of the trial run suggest that the response rates of our system are improved, compared to that of the conventional method. However, the trial is run in small scale. Accordingly, our system needs to be evaluated with large scale systems which are used by many students and faculties. In addition, our system uses Shibboleth of version 2 which is not latest one, and hence it is necessary to rebuild our system with latest version.

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References

- (1) Keding A, Brabyn S, MacPherson H, Richmond S.J, Torgerson D.J. Text message reminders to improve questionnaire response rates. *Journal of Clinical Epidemiology* 2016; **79**:90–95.
- (2) Kitagawa T, Oka H, Kaji Y. An Anonymous Questionnaire System for Rating Faculty Courses in Universities. *Transactions of Information Processing Society of Japan* 2003; **44**(9):2353–2362.
- (3) Shibboleth. <https://shibboleth.net/>. Accessed March 1, 2017.
- (4) FPSP. <https://meatwiki.nii.ac.jp/confluence/pages/viewpage.action?pageId=12158554>. Accessed March 1, 2017