Study of Function Design to Improve the Convenience of #-Mail Solution Aspect of User Experience

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Abstract
According to enforcement of basic acts for electronic document and electronic commerce, certified electronic address system is introduced and as certified electronic document intermediary system is introduced, new market for #-Mail service is emerging. For #-Mail service, #-Mail solutions which enable to use are provided other than institutional portions and the currently provided #-Mail solutions are only provided as the form of Portal. However, many users generally show their user experiences which are familiar with Microsoft Outlook and e-mail solutions provided by Groupware. Study objective is regarded as meaningful where design method through the prototype to materialize #-Mail solution of existing portal form as Microsoft Outlook’s embedded function is to be suggested as one of the ways to improve the conveniences of the users from the viewpoints of the User Experience in this study, and technical methods to improve the practicality and applicability of #-Mail is suggested.

Keywords: #-Mail, User Experience, Electronic Document, Authorized Electronic Address

1. Introduction
Electronic documents are digital records expressed for both man and machine can understand. [1] One of the policies pushed by Korean government to strengthen the distribution of electronic documents is ‘Certified electronic address-based electronic document distribution’, i.e., #-Mail service, which ensures non-repudiation of documents delivered and received.[2] To run certified electronic address-based #-Mail service, certified electronic address-based #-Mail solution, certified electronic document storage (intermediary center) and certified electronic address are needed, [2] and most of current #-Mail solutions are provided in the form of Web solution of portal. That is, the users need to buy and install a new solution to utilize #-Mail service, which may cause a little inconvenience to the current e-mail users in the aspect of user experience at the first time.

In addition, as digital develops, users demand more through experiencing various devices, and the users who have many options want to decide easily and quickly.[3] Many studies are being conducted in the various fields for these user experiences. The conclusion of the study of [2] also states the need of expanding the application to portals (Naver and etc.,) and Microsoft Outlook which are most frequently used publicly.

Accordingly, a #-Mail solution function design method grafted onto Microsoft Outlook which are generally used by many users is intended to be suggested in this study as a way to establish #-Mail solution as a more user-friendly solution.

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2. Related Studies

2.1. #-Mail Solution

#-Mail solution provides non-repudiation function in accordance with Framework Act on Electronic Commerce by issuing contents encryption, electronic signature and distribution certificate for message security, and also provides the function of issuing distribution certificates for transmission, reception and reading and of transmission assurance by which the undelivered documents are re-transmitted through distribution hub. These are the differences with e-Mail for which many studies [4-11]. [12] And also, it has the special features of using multi-layer structure mainly based on ebMS and HTTP, and of embodying in the form of XML document.[2] The #-Mail solution with these special features is embodied by private specialized solution development companies and provided to the companies conducting certified electronic document storage business and configuring #-Mail service. Provides solutions are as followings, all of which have same characteristic of adopting the service of portal form. This is because all of the solutions have been realized based on the open patents [13-14] related to ‘Certified electronic address-based electronic document distribution’. And also, as the #-Mail service has the form of a portal [15-17], it is in the structure to be used after entering URL on the relevant portal. These solution use and log-in procedure are some of the causes to give onerousness to users in the aspect of user experience.[18, 19]

2.2. Concept of User Experience

User Experience (hereinafter called UX) is an overall experience that users feel and think in directly or indirectly using a certain item, product or service, which may be achieved through the participation, use, observation by users and interaction between users and the system in the overall area for which users can perceive as well as through functional or procedural satisfaction. [20] In addition, UX may be formed through interaction with products. As users may get some benefits through a product, providers also get some results through the product. [21] That is, UX is a quite broad concept including emotions, beliefs, preferences, perceptions and physical or mental responses or actions of users occurring before, during and after using a product. And it has some characteristics which differentiate itself with interface or interaction.

First, experience has subjectivity which is fundamentally same as the effect accumulated inside of the human. Secondly, the experience is holistic and it has strategically a very big meaning to design the experience as the experience is a holistic one felt by a certain person at a certain time, and so it gives a big effect on the success of a product or a service. Finally, the third characteristic is the contextuality. To experience a certain product or a service is not only determined by the features of the product or service, but is affected by the environment and context at the time of interaction, and as the user environment and context are changed dynamically, UX is also changed dynamically. So experience is formed through a relatively longer time period, compared with interaction or interface.[22]

2.3. Study in Relation to User Experience

Many studies for user experience are being conducted in the various fields and in the various subjects from the study for the smart devices in the aspect of UX[3] to bio-signal based-fatigue measurement study[23], and also studies in the software area such
as iOS application GUI test study[24] are being conducted. But there is almost no UX study for #-Mail.

In this study, the functional design is made by using prototype technique to provide functions to enable users who are accustomed to Microsoft Outlook Solution to use #-Mail, which is currently provided in the form of portal, in the Outlook. The study has been conducted differently with existing studies in the sense that it has studied embodiment of #-Mail solution[2], being focused on non-repudiation function.

3. #-Mail Functional Design

3.1. Utilizing Patterns of Portal form #-Mail Service

The currently provided #-Mail solution can be applied in either case of using the service provided by certified electronic document intermediary or establishing in-house certified document intermediary system, getting the license for it from National IT Industry Promotion Agency. The pattern of #-Mail service in the aspect of the process is as shown in (Figure 1).[2]

![Figure 1. Pattern of #-Mail Service in the Aspect of Process](image)

As shown in (Figure 1), users draft and reads documents, and these activities are provided with the functions of security and non-repudiation for the transmitted or received documents through the distribution certificate issued by the intermediary which the users subscribed to.

When this #-Mail service is applied to Microsoft Outlook, such additional functions to enter #-Mail address and to select the intermediary from which the person or the company gets service should be provided. The prototyping of these functions is as (Figure 3).
Prototyping is a small sized product for presentation and a working model reflected with user requirements, which is a design method suggested for information system[25]. In this study, we have defined improvement functions as user requirements, and suggested the desirable appearance for actual screens and functions by applying prototyping technique.

![Figure 2. Prototyping of Mail Account Setting in Microsoft Outlook](image1)

![Figure 3. Prototyping of Change Function in Mail Account Setting in Microsoft Outlook](image2)

Like this, it should be possible to additionally enter master information such as #-Mail accounts of users who may use #-Mail service and to set and save the entered data as user profile through embodiment of the presented screen and functions.

Next, as the (Table 1) stated in the study [2], a protocol call and message processing functions should be realized to be able to process the communication protocol and document format different with the elements necessary for transmission/reception of existing e-Mails.

<table>
<thead>
<tr>
<th>Division</th>
<th>e-Mail</th>
<th>#-Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Protocol</td>
<td>SMTP 1 level structure</td>
<td>Multi-level structure mainly based on ebMS, HTTP</td>
</tr>
<tr>
<td>Embodiment</td>
<td>Simple structure of text form</td>
<td>Configure with XML document form</td>
</tr>
<tr>
<td>Process</td>
<td>Users check documents with POP3</td>
<td>Transmission and reception protocols are same.</td>
</tr>
</tbody>
</table>
To process the characteristics of #-Mail service shown in the (Figure 1) and (Table 1), a function to distribute the messages suggested in the study [2] should be embedded in Outlook. The details to realize these necessary functions are the interface and adapter function configurations as shown in (Figure 4) and (Figure 5).

(Figure 4) is a module to provide message distribution function. In the message box of messages from senders, the module for distributing messages sends and receives SOAP messages according to HTTP/S. According to technology standard of distributing and connecting messages, SOAP messages are packaged and the packaged messages are analyzed. Data is extracted from each item and the structures of the packaged messages are verified. The module has functions of storing sent and received messages. [2]

(Figure 5) is a module to manage distribution information. This module is developed to offer a wide range of functions from managing authentication certificates which register, modify, delete official authentication certificates on the distribution server to managing certificates of distribution, managing certificates of distribution, managing distributed messages and managing message boxes of sent and received messages by user (registering, deleting, checking). [2]
As shown in (Figure 4) and (Figure 5), after embedding the functions for message distribution and distributed information management in the Outlook, the provision of a function to enable sending and receiving of #-mails on the user screen is necessary. That is, the provision of an additional function of ‘sending non-repudiation mail’ to send and receive #-Mail as shown in the (Figure 7) through a prototyping as well as the function of ‘sending’ for sending and receiving e-Mails, which has been provided on the existing Outlook screen like (Figure 6), is necessary. And also, this function should have embedded procedure and function shown in the (Figure 4) and (Figure 5). This is because the #-Mail is different with common e-Mail in the aspect of functions and fare charging. While e-Mails are sent and received with no charge, but also with no provision of non-repudiation function, #-Mails may be charged depending on the counterpart, but with the function of non-repudiation provided. So separate sending/receiving functions should be provided for each one respectively.

![Figure 6. Function of 'Mail Send' in Microsoft Outlook](image)

In this aspect, both of the common mail sending and #-Mail sending functions as presented through prototyping in (Figure 7) should be provided.

![Figure 7. Prototyping of '#-mail Sending' in Microsoft Outlook](image)

As the ‘non-repudiation’ function shown in the (Figure 7) is charged depending on the counterpart, the #-Mails should not be sent by just clicking send button. As shown in the (Figure 8), the program should be designed to have an additional checking procedure before
sending. And the function to manage the sent messages, identifying common e-Mails with #-Mails in the sent message box, should be provided.

Figure 8. Prototyping of ‘#-mail sending’ Function

We have presented a design and a method through prototyping technique, mainly based on the functions which may improve user convenience by grafting #-Mail into Microsoft Outlook so far.

When a new concept like # -Mail service is applied to a familiar solution like Outlook, it can be activated through the increase of use brought by the internal accumulation effect which the users have been feeling based on the experience so far. And as users can use both of the common mail and # -Mail at the same time on one point of contact (solution), the convenience may be improved by reducing the inconvenience which users may feel in entering a separate URL to go for # -Mail. Like this, if all the functions can be provided on one point of contact, the possibility of success of the solution and service may be positively affected in the holistic aspect, the second characteristic of user experience. This may make a virtuous circulation that the user experience is followed by the activation through increase of # -mail use like contextuality, the third characteristic of user experience. The summary of characteristics and differences in the aspect of user UX is as shown in (Table 2).

Table 2. Difference of Embedded form # -Mail Solutions

<table>
<thead>
<tr>
<th>Division</th>
<th>Existing Portal Form</th>
<th>MS Outlook Embedded Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>User UX-aspect Characteristic</td>
<td>Need separate URL</td>
<td>One-stop processing inside Outlook solution</td>
</tr>
<tr>
<td></td>
<td>Existence of separate log-in procedure</td>
<td></td>
</tr>
<tr>
<td>Point of Contact</td>
<td>Multi. point of contact (Using separately with e-Mail)</td>
<td>One point of contact (Using inside Outlook)</td>
</tr>
<tr>
<td>User Convenience</td>
<td>Low because it is a separate system</td>
<td>Relatively high because of using function in the familiar solution</td>
</tr>
<tr>
<td>Ripple Effect of Use</td>
<td>Low (Limited use)</td>
<td>High (Wide user range)</td>
</tr>
</tbody>
</table>
The characteristics and differences compared in the (Table 2) have relation to ‘embodied cognition’ which is under discussion in the aspect of UX or in cognitive science. Embodied cognition is a paradigm[24] to understand the problems in the traditional approach to the mind and overlooked issues from a new point of view and develop them, surpassing the level of complementing and advancing information processing theory. If contemplation from various point of views are made in the link with the theory[26] of ‘embodied cognition’ of users in the aspect of cognitive science, embedded cognition, enactive cognition and distributed cognition in the aspect of approach as well as for the aspect of improving convenience based on user experience which is suggested in this study in the aspect of various consideration for user experience of a new service, it may help with the improvement of user convenience which will lead to promoting the use.

4. Conclusion

This study suggests a method to improve convenience of #-Mail solution, the service of which is about to start according to Framework Act on Electronic Commerce, in the aspect of user experience.

The success of a solution and a service may be determined depending on how it approaches users quickly and easily with user experience and embedded cognition of users. In this regards, this study suggests a design and a method through prototyping technique for the idea about how to graft #-Mail functions onto Microsoft Outlook which the most users use for e-mails and about the key functions of #-Mail. And also, this study has a meaning that it has differentiated itself with existing studies by suggesting a technical method to activate and promote #-Mail service.

As for the direction of future study, except the technical method to promote use, the study to find out what relation the concept like ‘embedded cognition’ in the aspect of cognitive science, which is taking a place as a new paradigm, has with the establishment and activation of a new service such as #-Mail should be conducted. And also, various studies, with theory and field grafted together, for the aspect of human behavior such as how to lead the ‘embedded cognition’ to the increase of actual rate of use of #-mail seem to be necessary.

References


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