

Complexity and ease of use: A design study

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M. Smith, A. Dickinson, A.F. Newell, Complexity and Ease of Use: A Design Study. Gerontechnology 2006; 5(2):113 -117. This short paper is a study of the user interface design experience for a prototype mail system targeted at an audience of older people with little or no experience of computers. The prototype was aimed at providing an engaging first experience for the target audience in an attempt to close the 'digital divide'. A 'radically simple' user interface design philosophy was adopted that proved popular and preferable in comparison tests to those of a commercially available equivalent.

The paper focuses on the user interface design experiences gained with respect to following a 'radically simple' design philosophy that attempted to avoid design complexity and to create a user interface that was genuinely easy to use. The paper concludes with a discussion of where and how complexity arises, whether some complexity is inherently necessary and whether the radically simple design philosophy would extend beyond the initial prototype.

Keywords: interface design, complexity, usability.

A significant proportion of the UK population, typically older people, the disabled or the poorly educated do not use the internet. The UK Department of Education and Skills thus funds an ongoing programme of research and development, called the 'Cybrarian' project, aimed at closing the 'digital divide' in the UK by turning non-users into users.

This paper is concerned with the user interface design of a prototype email system that was developed and tested as part of the 'proof of concept' phase of the Cybrarian programme¹. The target audience were older people, for whom a lack of confidence and minor disabilities, such as poor eyesight, represented barriers to getting started with internet use.

The challenge for the user interface design team in the proof of concept was to create an email system that was not only easy to use, but would attract the

user into further use of the internet by providing a pleasant and rewarding first experience.

THE NEED FOR THE RADICALLY SIMPLE

Many applications present too much functionality, too quickly, which risks discouraging beginners². Microsoft's Outlook Express is one example and was used in the comparison user evaluations³. In the UK it is commonly used as the default mail reader by computer manufacturers and internet service providers. Out of the box it has an opening screen with over 250 clickable, draggable or selectable things for the user to do. The screen is divided into seven separate areas for folders, contacts, messages, preview pane, toolbars and so on. These areas have movable area dividers, a toolbar of nine buttons, and six menus, each with numerous menu items and slide outs, not to mention all the standard window functions.

Outlook Express and its Office counterpart, Outlook, provide a wealth of functionality, built up over successive releases. For an experienced user this array of functionality is undoubtedly useful, although it is doubtful that any single user uses more than 25% of the available functionality. For a novice user this level of functionality can be quite overwhelming, as demonstrated in the Cybrarian proof of concept study³. Given these observations, a 'Less is More'⁴ approach is an attractive solution. Buxton argues that generalised systems become decreasingly useful as more functions are added: a system designed for a specific purpose or a specific audience can be much more effective⁴. Buxton also argues for the design of the user experience in software development⁵. The adoption of a radically simple design philosophy in the development of an email prototype is an attempt to design an attractive and encouraging user experience.

THE 'RADICALLY SIMPLE' DESIGN PHILOSOPHY

'Radically simple' was a phrase coined by a design team after it had begun to set down some guiding 'principles' for the mail prototype's user interface design. 'Principles' is in inverted commas because they were occasionally broken and compromised for a variety of reasons. Below are some of the 'principles' adopted that relate to user interface design complexity. Other principles relate to, for example, readability and accessibility,

which were equally important, since our target audience suffered from minor disabilities, but are not discussed here^{1,3}: (i) Provide only basic functionality; (ii) Minimise the number of functions on any screen: 10 was too many; (iii) Each screen to have a single primary function or purpose: overloading a screen with direct access to all sorts of functionality is one of the prime sources of complexity and confusion; (iv) Minimise the need for the user to change focus or selection: for the uninitiated user the concepts of focus and selection are foreign. Commonly used interface design conventions could not be assumed for our target audience; (v) Minimise the number of data entry fields per screen: we plumped for 1³; (vi) Avoid selection mechanisms, especially multiple selection³; and (vii) Adopt a simple and consistent 'select & operate' paradigm^{3,5,6}.

As a reader with experience of any modern office application will appreciate, these principles are, indeed, quite radical, and severely limit the user interface design choices. At the same time they result in a system which is extremely simple to use, and hence the term 'radically simple' was coined.

COMPARISON STUDY AND RESULTS

Fifteen older participants with no internet experience individually attended two evaluation sessions and performed a series of email tasks with the experimental system and the control system, Outlook Express.

Table 1. Comparison of end of session ratings of Cybrarian prototype and Outlook Express on a scale of 1 to 7, with 1 strongly positive and 7 strongly negative

	Ease of use		Pleasantness		Ease of remembering	
	Visit 1	Visit 2	Visit 1	Visit 2	Visit 1	Visit 2
Cybrarian prototype	2.07	1.86	1.93	1.5	2.27	2.21
Outlook Express	4.33	4.71	3.33	3.79	3.93	4.71
Difference	-2.26	-2.85	-1.4	-2.29	-1.66	-2.50
Wilcoxon Z-Score	-3.205	-3.192	-2.992	-3.211	-2.989	-2.992
Probability	0.001	0.001	0.003	0.001	0.003	0.003

The complete results of the evaluation are provided in Dickinson et al.³, but can be summarised as follows, using the experimental system: (i) Participants were able to complete more tasks without any assistance; (ii) Participants made fewer errors; (iii) Participants hesitated on fewer occasions; (iv) Participants requested help on fewer occasions; and (v) Participants rated the email prototype better on ease of use, pleasantness and ease of remembering (*Table 1*).

Qualitatively measured user reaction from semi-structured interviews, was also positive: respondents strongly preferred the Cybrarian system and would have used it again³.

The experimental results demonstrated that a system designed according to 'radically simple' principles provided an easier and more positive initial experience of the internet for novice older users. However, it is important to ask what the consequences of such a design philosophy will be in the longer term. In the remainder of this paper this question is explored.

THE CONSEQUENCES OF THE 'RADICALLY SIMPLE'

In this section we revisit a selection of the design decisions and consider some of their implications from two perspectives (i) Continued development of typical mail functionality, essentially abandoning principle (i) from page 114 to provide a comparable level of functionality to Outlook Express, and (ii) The consequences for users with greater computer experience.

Wizards naturally conform to the principles

The design team quickly realised that a wizard style user interface could be used to instantly satisfy many of the principles. Thus for example the '*sending of a message*' was supported by a sequence of three screens: (i) Select a recip-

ient; (ii) Set the subject or heading, and (iii) Compose the text.

Such a wizard readily satisfied some principles^{3,5} concerning change of focus and minimising data entry fields, and contributed to the preferences expressed by our target audience³. However, the use of such wizard designs does lead to some issues that need to be resolved:

Issue 1

Since they only saw a small part of the interface at a time, users were not always sure how it related to the rest. One example of this was that some users attempted to type their full message in the subject field. A similar phenomenon can occur with hierarchic menu structures⁶. The interface design included a space for hints and instructions and so this was used to explain the user's position in the process.

Issue 2

Making provision for dealing with mistakes, or allowing the user to go back to make a change in a previous step, ironically introduces a level of complexity that the original design philosophy had sought to avoid. Three solutions were considered.

The simplest strategy would be to support some kind of 'back' button, and to force the user to abandon the current step and to repeat the previous step from scratch. The consequences of this would be that the user might be forced to retype the subject and message text to correct each and every error. For our target audience, with poor typing skills, this might prove to be a never ending, or at least a very frustrating, task.

An alternative would be to allow the user to move backward and forward through the steps, but preserving the text typed so far. However, this immediately con-

flicts with another principle³, which is concerned with change in focus, something that the target audience found quite difficult. Nonetheless, this was the alternative that was pursued.

The third alternative, which was not actively pursued, would be to allow movement backward and forward through the steps and to additionally support some kind of 'edit' or 'correct' button, which would take the user to a specialised edit screen. This obviously increases the number of screens required, and as a consequence increases the risk of navigation and context confusion.

Issue 3

In considering how to extend the functionality to include, for example, multiple recipients, a single attachment, multiple attachments, cc recipients and so on, the wizard design soon becomes overly cumbersome, and very long winded. In addition the longer sequence of steps simply compounds the problem of dealing with errors and changes.

The (multiple) selection problem

Most user interface designs use a Select & Operate paradigm in which the user first selects an object (by clicking on it) and then selects an operation by clicking on a function button or menu item; both clicks take place on the same screen. Such a paradigm can be readily extended to include multiple selections, using control-click or shift click. Applications such as Outlook Express can thus make almost all functionality available from a single screen. The Cybrarian mail prototype used a simpler paradigm: click to open the object in a *new screen*, and then click on a function button. The consequence of this approach is that one screen in a *select & operate* regime translates into two screens using the *click to open and then operate* regime. So what are the issues with such a radically simple approach?

Issue 4

It introduces a second screen, adding to the complexity of the application navigation. It becomes important to support the user in remembering the context in which they are working.

Issue 5

It has the effect of pushing functionality deeper into the hierarchy of application screens. This, of course, simplifies the original screen, by hiding available functionality until an object is opened. This led to some user confusion, for example, the inappropriate use of write-message (directly visible on the inbox screen) instead of reply-to-message (only visible upon opening a message). A similar experience is reported with hierarchic menus⁶.

Issue 6

The *click to open and then operate* regime almost eliminates any prospect of multiple selections, for example the deletion of unwanted messages, or the selection of multiple recipients.

From these few issues, for one piece of functionality, it can be observed that a 'Catch 22' situation has arisen: the radically simple design approach creates design complexities in its own right. Whilst each of these design issues can be solved using the radically simple design approach, the number of screens would grow significantly with each issue solved and with each additional piece of functionality.

The experimental results³ showed that the radically simple design approach definitely has its place and can be used to create a pleasant and confidence building first experience for older beginners. The question then arises: can such an interface design be adapted to support user progression to greater levels of functionality?

CONCLUSIONS

Whilst the experimental studies demonstrated the very positive role that the radically simple interface design had on creating an engaging first experience for our users, the purpose of this paper was to illustrate some of the issues in how the user interface can be developed further to support greater levels of functionality, and the progression from a novice into a more experienced user. We have used some illustrations of how simplicity can, somewhat ironically, lead to complexities as the user is progressed through greater levels of functionality and experience levels. Our conclusion is that the radically simple design philosophy is not sustainable through these greater levels of functionality and experience. What is required are transitioning mechanisms from the radically simple to the more conventional user interface design conventions.

For example: From the step by step, screen by screen, wizard style of interface, to a single screen with multiple data entry fields, and some kind of support or help in changing the focus; and: From the *click to open and then operate* paradigm, to a *select & operate* paradigm in which functionality is pulled back up the screen hierarchy and made available on the parent screen.

The Cybrarian Proof of Concept project¹ did explore the possibility of introducing explicit levels of increasing functionality in a separate prototype for web search and navigation⁷ in a similar way to 'layering' techniques advocated by, among others, Shneiderman⁸. The difficulties encountered relate to (i) How to give the user control over moving from one level to the next, (ii) How to support the user in progressing from one level to another, and (iii) How to decide upon the suitable content of each level.

In summary, what is required are some techniques and approaches in user inter-

face design for the direct support of learning and progression from a novice style of user interface through to the more experienced.

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