The Effect of Size of Personalised Menus on User Satisfaction

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Abstract: - In this paper we investigate empirically the effects of menu size on the personalisation approaches. Therefore, we investigate empirically the use of different size of five different interactive menu conditions: adaptable, adaptive split, adaptive/adaptable highlighted, adaptive/adaptable minimised and mixed-initiative menus. The aim of the study is to find out the effect of menu sized on the user satisfaction of these five menus. Results shows that in overall, in small menus, the minimised condition was the most preferable one, followed by the adaptable, and highlighted menus. By contrast, the adaptive split and mixed-initiative approach were selected as the most undesirable menus. On the other hand, in large menus, the mixed-initiative condition was the most preferable one, followed by the minimised approach. In contrast, the adaptable menu was the most unwanted menu followed by the adaptive split menu.

Key-Words: - Adaptive, Adaptable, Mixed-initiative, Menus, User satisfaction, Interactive systems, Usability

1 Introduction

One cannot deny the role of personalisation approaches such as adaptive, adaptable, and mixed-initiative on reducing the complexity of graphical user interfaces. The visual complexity of interfaces has become recognised as a phenomenon which some researchers call creeping featurism [1, 2] and others bloatware [3]. To overcome this problem and reduce their visual complexity, researchers have sought to determine which of the personalisation approaches has more effects on interfaces and users satisfaction. Some studies of menu design have focused on organising menus by using sorting techniques such as alphabetical order and categorical colour-coding [4]. Other studies have focused on visualising menu items. For example, circular menus have been developed so that all menu items are equally distant [4]. However, these studies were carried out on menus that can be organise by utilising sorting techniques. In larger or more complex menus that are difficult to organise by sorting techniques, personalisation is essential. This suggests that menus need to be personalised to each user [5]. Consequently, for example, an adaptive split menu is used for font selection in Microsoft Word 2000. However, as [6] points out research to date has tended to focus on proving one side of the argument rather than understanding the aspects and reasons behind making some of them successful in one part and failed on another one.

There are three approaches to personalisation. Adaptive interfaces dynamically change the interface layout and content to each user’s needs, while adaptable interfaces provide customisation techniques which permit users to adjust their layout and content to suit their needs. Mixed-initiative interfaces combine these two approaches to provide what best suits the user [7]. On the other hand, these approaches differ in their control of personalisation. Adaptive approaches are system controlled, adaptable approaches are user controlled and mixed initiative approaches are both system controlled and user controlled at the same time [5]. In addition, there are differences in the techniques they tend to use. For example, adaptive interfaces have tended to use graphical or spatial techniques, or a combination of both, to reduce visual search time [6]. The Graphical techniques recognise items and change them graphically, whereas spatial techniques recognise such items and move or copy them for easier access. Adaptive split menus, for example, move the most frequently/or recently used items to the top of the menu [7]. Moreover, recently ephemeral menus have been introduced to reduce search time by presenting predicted items immediately, while remaining items gradually fade in [6]. On the other hand, adaptable interfaces have tended to use coarse-grained or fine-grained, or a combination of both, to reduce visual complexity [5]. The coarse-grained allow users to move items to up or down, whereas fine-grained allow users to
move items to specific position on the list. For example, these techniques utilised in the adaptable split menu to allow users to move items moved to the top or bottom partition [5].

There has been some debate as to which of these approaches is best [8]. One side argues that users should be provided with easily predictable mechanisms to manage their tools, while the other believes that they need the right adaptive algorithm to help them focus on their tasks, rather than on managing their tools. Despite this debate, far too little attention has been paid to comparing the adaptable, adaptive and mixed-initiative approaches.

2 Previous works
A large and growing body of literature has investigated to reduce selection time by making recently and frequently selected items easier to select. An examination of the current research on personalisation reveals contradictory findings. By way of illustration, a controlled lab study with 27 subjects compared the efficiency and satisfaction of static, adaptive, and adaptable split menus [5]. The result showed that split static menus were significantly faster than adaptive menus. The adaptable menu was faster than the adaptive menu when participants were guided by example, because they were able to understand the value of customisation. In addition, results showed that in these circumstances there was no significant difference between the adaptable and static menus. Nevertheless, 55% of subjects preferred the adaptable menu, 30% favouring the adaptive menu and 15% the static menu. Another study, compared the performance and satisfaction of adaptive and static menus using 26 subjects [9]. Subjects were asked to search for names in a telephone directory that users can access through a hierarchy of menus and tested it against a static system. The most interesting finding was that subjects performed faster with the adaptive system, and 69% of subjects prefer the adaptive system. In another study, a sixty-three subjects were requested randomly to complete 24 tasks using both menus. The results showed that eighty-one percent of the subjects preferred the static to the adaptive menu [10]. Another study compared an adaptive menu with a static one. In a controlled experiment, sixty-three subjects were requested randomly to complete 24 tasks using both menus. The results showed that the static menu was faster than the adaptive menu on the first group of tasks, while there was no difference in the second group of tasks between the static and dynamic menus, because subjects in both groups were able to increase their performance significantly. Eighty-one percent of the subjects preferred the static to the adaptive menu [16]. In addition, a six-week field study with 20 participants evaluated two interfaces combined with the adaptive
menus in the commercial Microsoft word processor MSWord 2000. These were a personalised interface containing needed features only and a default interface with all the features. During the first four weeks of the study participants used the adaptable interface, then the adaptive interface for the remaining time. It was found that 65% of participants preferred the adaptable interface, 15% favoured the adaptive interface and the remaining 20% chose the MSWord 2000 interface. However, according to [11], there were two potentially confusing variables. First, MSWord 2000 and the proposed interfaces had very different designs, which might have differed in their usability. Second, all participants completed the adaptive condition after the adaptable condition. McGrenere et al. carried out a controlled laboratory experiment with 27 participants to compare the efficiency of three of the Sears and Schneiderman [12] split menus. The first of these was a static split menu, the second an adaptable split menu where the top half was adaptable by the user and the third an adaptive split menu, where the system would dynamically assign the top half based on frequency and recently of selection. The results showed that 55% of subjects preferred the adaptable menu, 30% favouring the adaptive menu and 15% the static menu. Another study compared an adaptive menu with a static one. In a controlled experiment, sixty-three subjects were requested randomly to complete 24 tasks using both menus. The results showed that the static menu was faster than the adaptive menu on the first group of tasks, while there was no difference in the second group of tasks between the static and dynamic menus, because subjects in both groups were able to increase their performance significantly. Eighty-one percent of the subjects preferred the static to the adaptive menu [16]. In a laboratory experiment with 18 participants, Jameson and Schwarzkopf directly compared automatic recommendations, controlled updating of recommendations and a condition where no recommendations were available. The comparison was concerned with content rather than the graphical user interface. In the automatic recommendation (i.e. adaptive) system, the updating was performed automatically by the system, while in the controlled updating of recommendations (i.e. adaptable) system, it was done by users, and in the third (static) system, no recommendations were provided to users and the system did not change during usage. Jameson and Schwarzkopf found no difference in performance score between the three conditions. Recently, another study examined a new adaptive technique called ephemeral adaptation. Ephemeral menus recognise predicted items immediately, while remaining items gradually fade in [6]. These new techniques were examined with static and highlighted adaptive menus. The results showed that ephemeral menus were faster and preferred over the static control condition when adaptive accuracy was high, and no slower when adaptive accuracy was low. In addition, ephemeral menus were faster than highlighted adaptive menus, while both were preferable to static menus.

Figure 2. (a) adaptive highlight menu; (b) mixed-initiative menu; (c) adaptive split menu; (d) adaptable menu; and (e) adaptive/adaptable menu (Minimised and hide unused menu items).
Most studies in the field of personalisation have only focussed on studying the differences and similarity between the adaptive and adaptable approach. Consequently, there has been a small amount of research into mixed-initiative interfaces, including a study which compared an adaptive bar (mixed-initiative system) with the built-in toolbar present in MSWord (adaptable system) [13]. It found that the mixed-initiative system significantly improved performance in one of two experimental tasks.

3 Experiment

3.1 Subjects
A total of 60 graduate or undergraduate students voluntarily participated, 30 each on small and large menu designs. These were split 16 / 14 and 19 / 11 respectively between males and females. The ages of subjects in both experiments ranged from 18 to 44, while their average computer usage exceeded 12 hours per week. In both experiments, each subject was randomly assigned to one of five groups of 6 subjects, each of which followed the five experimental menu conditions in a different order. Subjects were given one recorded tutorial according to the experiment they participated in.

3.2 Apparatus
An application program was developed using Microsoft Visual Basic.Net. Personal computers with Pentium IV 1.5 GHz processors and 17 inch monitors were used in the experiment. Figure 1 shows the screen layout of the application program used in the experiment.

3.3 Menu types
Five different menu conditions were tested in the experiment: adaptable menu, adaptive split menu, adaptive/adaptable highlighted menu, adaptive/adaptable minimised menu and mixed-initiative menu. In the adaptable menu, subjects could modify the order of items by moving them up or down. This occurred after the first session of the experiment (50 selections). The adaptive split menu was divided by two horizontal lines into three sections. The top section comprised the two most frequently selected items, the second section the two most recently selected items and the bottom section the others. The menu software counted how many times each item had been used in the 50 most recent selections and updated the list after each selection. In the adaptive/adaptable highlighted menu, the most frequently selected items were boldfaced, while the others were not. After the first 50-selection session

Figure 3: Overall preferences
of the experiment, subjects could modify the order of items by moving them up or down. In the adaptive/adaptable minimised menu, the software counted how many times each item had been used, moving frequently selected items to the top of the list and separating them from other items by a horizontal line. The top section was extendable and kept the most frequently selected items separate from the bottom section. When the user wanted to modify and customise the menu, it would be divided by two horizontal lines into three sections. The top section held the two most frequently selected items, the second section comprised the two most recently selected items, while the bottom section contained the others and was hidden. Users could view the hidden items by clicking a small arrow at the end of the menu. In the mixed-initiative menu, the technique was to display the recently or frequently used items to subjects at the appropriate time. The recently selected items were displayed at the top of the menu when this feature was selected by clicking on a button labelled ‘Recently’, while the frequently selected items were displayed when the ‘Frequently’ button was selected. Both techniques boldfaced the actually selected items, while the bottom section contained the others and was hidden. Users could view the hidden items by clicking a small arrow at the end of the menu. In the mixed-initiative menu, the technique was to display the recently or frequently used items to subjects at the appropriate time. The recently selected items were displayed at the top of the menu when this feature was selected by clicking on a button labelled ‘Recently’, while the frequently selected items were displayed when the ‘Frequently’ button was selected. Both techniques boldfaced the recently or frequently selected items and moved them to the top. Subjects were only able to choose one technique at a time, and could switch from one to another at any time during the experiment. It was the subjects’ responsibility to choose the correct technique, recently or frequently selected items and moved them to the top. Subjects were only able to choose one technique at a time, and could switch from one to another at any time during the experiment. It was the subjects’ responsibility to choose the correct technique. Figure 2 illustrates the five menu types tested in the experiment.

3.4 Menu labels
In the small menu experiment, 85 different nouns from five label categories (17 nouns in each category) were used as labels of the menu items, while for the large menus, there were 145 different nouns from the five label categories (29 in each category). The categories in both cases were vegetables, fruits, drinks, frozen food and ready meals. Nouns shorter than four or longer than eleven characters were excluded, while no more than four nouns in any category had the same initial letter. The category name was shown in the title bar at the top of the menu.

3.5 Experimental design
The experiment design and was planned to fit into a one-hour session, along with followed a within-subjects. Subjects were informed that the menu conditions were divided into two blocks. Block 1 consisted of a 50-item sequence selection and block 2 consisted of the identical 50-item sequence to block 1. Between the two blocks, subjects were given a 2-minute break. For the adaptable condition, subjects were allowed to take extra time during the break to customise their menus if they wished to do so. That was their only opportunity to customise.

3.6 Procedure
(1) subjects were randomly assigned to different orders of conditions depending on the order of arrival, then a questionnaire was used to obtain information on user demographics, education and computer experience. (2) Before starting each menu condition, subjects were given a recorded tutorial. (3) In the experiment, the subjects performed the five conditions in a pre-determined order given by the experimenter. A condition comprised of two task blocks, each of which contained 50 selections. Therefore, each subject performed a total of 500 selections. (4) Subjects were asked to choose the menu condition according to the order given by the experimenter. The first task block began when the subjects clicked the ‘Start’ button. Next, a target item was displayed on the screen and subjects were asked to select the same item from the pull-down menu as quickly and accurately as possible. If the wrong item was clicked a cross symbol appeared on the screen. The second target item appeared once the target item had been selected. When a subject selected the correct item, the menu was disabled for 1 s before the next item. Time between the presentation of the target item and the correct selection was recorded, as well as the number of errors (incorrect selections). In the adaptable and adaptive/adaptable minimised menus, subjects were told that they could change the positions of the items if they wanted to do so after the first block. In addition, the time required by each subject to customise the adaptable menu was recorded. Finally, a feedback questionnaire was used to rank the menu conditions, to assess subjects’ satisfaction and to record any additional comments.

4 Results
4.1 User satisfaction
At the end of the experiment subjects were asked to give ratings for 1 to 5 rating scale for user preferences. According to Figure 3 (a), the result shows that in the small menu exactly one-third of subjects selected the highlighted menu as the first
preferred menu, followed by the adaptable with 8 subjects, whereas exactly the same number of subjects (5) chose both the minimised and mixed-initiative menus as the best menu. By contrast, there was solely two subjects selected the adaptable menu as the best menu. On the other hand, the adaptive split was the least preferable menu among other menus with just over one-third of subjects. Followed by the mixed-initiative, highlighted, and adaptable menus with 8, 5, and 4 subjects respectively. In contrast, just two subjects selected the minimised menu as the unwanted menu. On the other hand, Figure 3 (b) shows that in large menu just under the half of subjects preferred the mixed-initiative menu, followed by the minimised, highlighted, and adaptive split menus with 7, 5, and 4 subjects respectively. By contrast, there was no subject select the adaptable menu as the best menu. In addition, this menu was categorised by 16 subjects as the most undesirable menu. Followed by, the adaptive split with 11 subjects.

In overall, in small menus, the minimised menu was the most preferable menu, with more than half of subjects chose it as the first and second preferred menu. Followed by adaptable, and highlighted menus with exactly half, and more than one-third of subjects chose them as the first and second preferred menus respectively. By contrast, the same number of subjects (17) chose both the adaptive split and mixed-initiative menus as the most undesirable menus. However, 11 subjects among 17 subjects chose the adaptive split as the last preferred menu, while 8 subjects among 17 subjects chose the mixed-initiative as the last preferred menu. On the other hand, in large menus, the mixed-initiative menu was the most preferable menu among thirteen subjects, with more than two-thirds of subjects chose it as the first and second preferred menu. Followed by the minimised menu with more than half of subjects chose it as the first and second preferred menu. In contrast, the adaptable menu was the most unwanted menu followed by the adaptive split menu.

5 Conclusion
The study reported in this paper empirically compared the user satisfaction of personalised menus. If the debate between personalised approaches is to be moved forward, a better understanding of the factors making some of them more successful in one context than another needs to be developed. Therefore, further experimental investigations are needed to understand these approaches from different perspectives.

References: