

Workflow on Mobile Phones

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ABSTRACT

Mobile devices and services are rapidly becoming a common property. In this paper, we describe what this development implies in terms of new content and new services. In the context of interactive services, we show how to implement workflow on mobile phones. Two main categories of design guidelines are presented and demonstrated through a concrete case: Navigation and work flow, and User feedback and error handling.

DESIGN GUIDELINES FOR MOBILE WORKFLOW MANAGEMENT

Now the mobile phone as the new user terminal and channel for business transactions is entering the scene. Enterprises explore how to make use of new channels and devices, such as mobile phones and other hand-helds. In doing so, enterprises must on the one hand focus on the organizational landscape of their business processes including organization of work and work flow, logistics and distribution, and the front-end functions. Our contribution concerns users of services which – due to the complexity – entail the realization of a workflow. Thus, the users of such services easily fall into the category of ‘professional users’. Online forms would serve as an example of such services.

It is reasonable to believe that the development of content and services will lead to more complex mobile services than seen until now. The service is often part of one or several business processes which may be more or less computerized. The workflow may be split into tens of tasks and hundreds of sub-tasks. The rules of case handling are comprehensive, including information exchange in a certain order, in a certain format, based on complex inter-dependencies.

Advice on how to design the mobile user interface is available, though. For the mobile phone, examples are the basic guidelines recommended by the W3C [1], or the guidelines suggested by Nikkanen [2] or Hays [3]. In order to manage the work flow of services, we focus on two main categories of HCI-requirements. The one is the organization and management of the work flow as such. The other is “rescuing” the user from error situations such as invalid input or unfinished tasks. Below, we discuss the most basic requirements to the HCI-design within these two topic areas in relation to the mobile context.

The business processes and the workflow of a service force a division of labor between the service provider and the user. The rules, the interdependencies between tasks and sub-tasks, and the information flow all together pose an extra challenge to the mobile use context. Information may have to be retrieved from several sources, a small screen is available for the presentation of the information, and on top of it all, a finalizing action such as sending, ordering, or submitting is often required. In addition, the mobile use context *inherently* increases the probability of short sessions and disturbances. As we see it, **good navigation mecha-**

nisms makes the service and its workflow work. Hence, following requirements are critical:

1. The main navigation should be placed identically on all pages or cards of the UI, and critical functions should never disappear.
2. The service should clearly express where the user is in the dialogue, and which tasks are active.
3. The system should make it possible to go back to earlier phases of the dialogue, and it should be possible to end or terminate the dialogue at all times.
4. In order to allow multiple navigation modalities the system should allow navigation by the device’s physical keys and by screen buttons.
5. The small size of the screen implies splitting the task between a number of pages or ‘cards’. However, one page or card should only contain related elements, and actions which are implemented as a series of pages or cards should be organized as a path of pages or cards, not a network.
6. Scrolling should be reduced to a minimum.
7. During complex tasks the system should inform the user about his/her progression.
8. If the user can initiate several simultaneous tasks, the method of initiation should differ from ordinary navigation and input.
9. In electronic forms it should be possible to proceed between (uniquely named) fields by using the Tab-key.

Error messages disturb any user, and even after decades of usability studies they are still often presented as cryptic alarms. In order to make the user experience smoother even in error situations, we put forward the following requirements:

1. Error messages that are connected to the use of the service should be explanatory, easily read and presented in the user’s mother tongue or the language he/she prefers.
2. If the information is intended for the technical support personnel, this should be explicitly stated.
3. It is also important that the error message is shown immediately after the occurrence of the error.
4. In case of repeated errors, the system should offer additional information or propose an alternative way to proceed.
5. Not troubling the user needlessly implies that if any input is out of range or illegally formatted, the system should accept the valid input, and only invalid input and /or uncompleted input fields should be shown to the user.
6. In case of web-applications the service should return automatically if the target page does not exist.

On the right, we will illustrate how the two requirements affect the HCI-design of our case application: the mobile phone demonstrator for the Norwegian Tax Authorities [4]. The ‘*mobile tax demonstrator*’ shall provide functionality for updating information required for tax calculations and consequently for ordering a

new tax deduction card. The demonstrator has been developed with the use of ServiceFrame which has been developed by Tellu AS [5] together with Ericsson NorARC as part of the ARTS research project [6]. It was created to support rapid development of internet and telecom services. This research has been conducted within the research project 'UNIMOD – Universal Design and Multi-modal User Interfaces', partially financed by the Research Council of Norway. The research teams of Karde AS (www.karde.no), Tellu AS (www.tellu.no) and the Norwegian Computing Center – NR (www.nr.no) have made contributions.

As stated earlier, one of the most important areas in the context of services is that of managing the work flow. In Figure 1 the use of 'cards' is illustrated. The phases of the current task are organized as task cards, and the user maintains an understanding of position and progression. The number of the active card is clearly marked.

Modern mobile devices have a joystick, a physical button or a touch-screen pen for input, and thus navigation. Naturally enough, one of these mechanisms has to be used for navigating between the cards. By moving between the task cards the user gets an overview of the sequence of (sub-)tasks, and an indication of the amount of work that is required. Pilot-user tests indicate that this way of visualisation works according to the intuition of the users. Some of the users first leaf through all the cards in order to get an overview of the workflow.

Within one task the information may often be more comprehensive than the size of the screen. We take it for granted that two-dimensional scrolling within each card should be avoided. We allow vertical scrolling, but we make an effort to manifest the position by a clearly visible scroll bar. The scroll bar also illustrates the relative vertical position on the card. The size of the scrollbar indicates the relative size of the visible content in contrast to the *available* content. Also for vertical navigation the user can apply the joystick, the navigation button or the touch-screen pen. In Figure 2 the *elastic* scroll bar is illustrated.

In a flow of tasks and in a sequence of dialogue activities the user needs a focal point. This may be connected to input or output, or to any information that the user manipulates. In our demonstrator, this challenge is solved by implementing a focal frame. This *frame* follows the active area of input or output as illustrated in Figure 3. Context sensitive *help*, that is information related to the focal frame, is available at all times (menu at the bottom left).

The input-output techniques deserve a good deal of attention. In connection with input or output users often arrive in error situations. In order to avoid some of these we have implemented a colour scheme that indicates invalid or incomplete input. The colour scheme changes when the task is completed correctly. Before completion, a field or a card is identified in a colour that differs from the ordinary colour scheme of the design. At any time, the user can at a glance know which cards are not completed. This mechanism also ensures the quality of input data as showed in Figure 4.

REFERENCES

- [1] W3C: Mobile Web Best Practices 1.0 – Basic Guidelines; W3C Proposed Recommendation 2 November 2006 <http://www.w3.org/TR/mobile-bp/>
- [2] Nikkanen, M.: *One-handed use as a design driver: enabling efficient multi-channel delivery of mobile applications* http://www.helsinki.fi/~mnikkane/publications/Nikkanen_One-handed_use.pdf

- [3] Hays, G.: *Guidelines for User Interfaces for Mobile Devices* http://www.developer.com/ws/article.php/10927_1143541
- [4] <http://www.skatteetaten.no>
- [5] <http://www.tellu.no>
- [6] <http://www.item.ntnu.no/avantel/projects/ARTS/arts.html>



Fig. 1. Marking of the active card/task in the task flow.



Fig. 2. Elastic scroll bar showing the relative position.

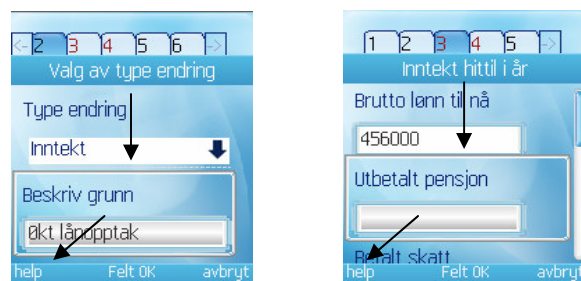


Fig. 3. Working area is accentuated by a frame.

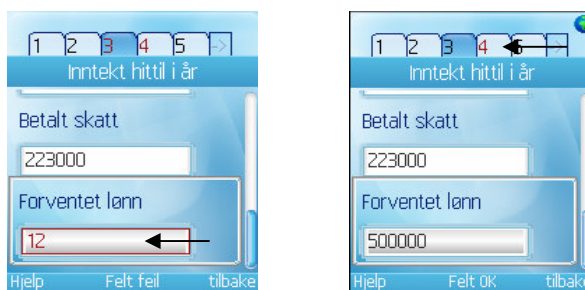


Fig. 4. Changes in the colour scheme indicate invalid input; input field containing '12' and card number '4'.