Chapter 2.10
An Activity-Oriented Approach to Designing a User Interface for Digital Television

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ABSTRACT

This chapter proposes an activity-oriented approach to digital television (DTV) user interface design. Our approach addresses DTV usefulness and usability issues and entails two phases. A user activity analysis is conducted in phase one, and activities and their social/cultural context are identified. DTV service functions are then conceived to support user activities and their context. DTV service usefulness can be ensured as a result. The user interface design considers both activity requirements and user requirements such as user's related product experience, mental model, and preferences in phase two. Consequently, DTV usability is achieved. A DTV user interface concept is thus proposed. The interface design concept contains the following design features: activity-oriented user interface flow, remote control for universal access, shallow menu hierarchy, display management, adaptive information presentation, and context sensitive functions. Usability evaluation results indicate that the user interface is easy to use to all participants.

INTRODUCTION

DTV has several advantages over conventional analogue television: better picture and sound quality, more channels, interactivity, and accessibility.

Many countries plan to switch to DTV within the next 5 to 10 years. To facilitate DTV user adoption, Hsu (2005) conducted a survey exploring factors driving DTV diffusion. Identified factors were: government support, reliable technology, price, DTV service usefulness, and easy-to-use user interface. Service usefulness and easy-to-use user interface were among the most important driving factors determining user adoption.

Identifying useful services and designing an easy-to-use user interface is challenging. First, DTV can be complicated for most users. After switching from analogue to digital, television is no longer just a standalone audio-video device. DTV is becoming central to the digital home by providing information services; controlling home appliances and security devices; supporting communication activities; performing business transactions; storing video images; and so on. Therefore, users' manipulation of numerous service applications and easily accessing what they want is critical. Secondly, nearly everyone may use DTV. However, different users may use DTV services for their own purposes and have different usage patterns. Moreover, users interacting with the system have different experiences and abilities. Therefore, accommodating diversified user needs and skill levels is also important.

The user-centered design (Norman & Draper, 1986) has been a dominant approach to user interface design in meeting usability requirements. The user-centered design approach essentially focuses on and includes the user in the design process, beginning with user identification and user tasks. User's target-market characteristics are identified according to user analysis. These characteristics include: demographic characteristics, knowledge and skills, limitations, attitude, and preferences. Based on these characteristics, product requirements can be determined. Task analysis identifies user needs in task performance. These needs include functions and information as well as control, enabling users to perform tasks. Task analysis results are used to specify functional and use requirements. The user interface considers compatibility between user's information processing limitations and task demands, to ensure usability. Since the user-centered approach recognizes that the design will not be right the first time, it suggests that an iterative design be incorporated into the product development process. By using a product prototype, the design can be refined according to user feedback. The user-centered design approach has been successfully applied to many computer products.

However, the user-centered approach has some drawbacks and limitations. Norman (2005) warned against using it in designing everyday products. He argued that the user-centered approach provides a limited design view. It is suitable for products targeted for a particular market and for specific user-task support, but everyday products are designed for everyone and support a variety of tasks. These tasks are typically coordinated and integrated into higher -level activity units. For everyday product design, Norman proposed an activity-oriented design approach. He asserted that a higher-level activity focus enables designers to take a broader view, yielding an activity supportive design. In a nutshell, the activity-oriented approach focuses on user activity understanding, and its design fits activity requirements.

In line with Norman's (2005) notion of activity-centered design, Kuutti (1996) proposed an activity theory application framework to the human-computer interaction design (HCI). According to activity theory (Engeström, 1987), an activity is the way a subject acts toward an object. An activity may vary as the object changes, and the relationship between the subject and object is tool mediated. Tools enable the subject to transform an object into an outcome. Furthermore, an activity is conducted in an environment that has social and cultural context. Two new relationships (subject-community and community-object) were added to the subject-object model. The community is a shareholder group in a particular activity or those who share the same activity objective. Rules and