The Many Faces of Consistency in Cross-Platform Design

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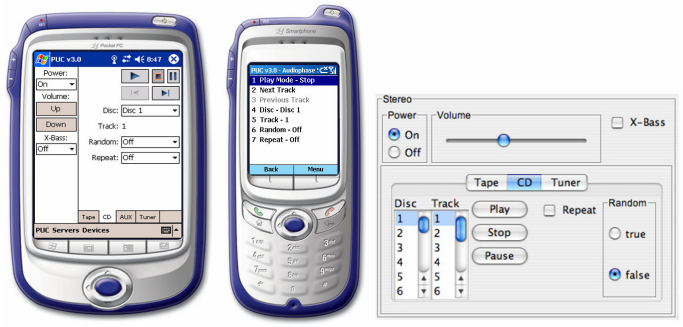
Abstract
This workshop addresses the role consistency plays in the design of applications and services that span several different computing devices. We will discuss the benefits and limitations of consistency, and methods to support the design and evaluation of consistent multi-device applications.

Keywords
Consistency, classification, multi-device, user interface design, cross-platform design

ACM Classification Keywords
I.3.6 Methodology and Techniques: Device Independence. H.1.2 User/Machine Systems: Human factors.

Introduction
Our digital lifestyles have changed dramatically in recent years: we make calls from our desktop computers, watch movies on our phones and read documents on our PDAs while occasionally moving our work to spaces with large high-resolution displays. What is more, we expect to easily transfer our digital activities from one platform to another as our interaction context changes. The challenge for user interface design is to ensure that users can seamlessly



a. b. c.

figure 1. Three different devices showing interfaces for listening to music. a) a stereo interface on a PocketPC PDA, b) the same stereo interface on a Smartphone, and c) a similar stereo interface rendered on a desktop computer. A key question: how are these interfaces consistent, if at all?

move between interfaces and continue to accomplish their tasks, even when the interfaces are presented on devices with dramatically different display and interaction mechanisms [9].

Consistency of Multi-device Applications

One means of ensuring a seamless interaction is to build *consistent* user interfaces. Consistency in cross-platform interfaces allows users to leverage their existing knowledge of an interface on one platform to make use of a similar application interface on a different platform [6]. Unfortunately, the challenge of building consistent multi-device interfaces is even more difficult than that of building consistent interfaces for applications on a single platform.

For example, consider a remote control interface for a shelf stereo that has been rendered on a PDA, phone, and in a desktop application (see **figure 1**). These interfaces all support approximately the same functionality, but they each have their own interaction styles and visual appearance. These differences can be attributed to the differences in input and output between each of the platforms. The PocketPC and desktop interfaces both have a two-dimensional layout because of their relatively large screens and pointer input. The Smartphone interface uses a very different list-based navigation because of its limited joystick input. The aspect ratio of the display can also affect the interface: note how the PDA interface is oriented vertically because its screen is taller than it is wide and vice versa for the desktop interface. As the diversity of devices grows, so will the difficulties with ensuring consistency across platforms.

There is also a question of when, and even whether, consistency should be ensured between applications running on different devices. If the task that the user executes on each device is the same, then it seems best to ensure consistency. In many cases however, the task may not be same. For example, it might turn out that users only use the stereo interface on their phone for making quick adjustments to the volume, whereas they use their PocketPC or desktop to change music sources or program the playback of tracks. The concept of horizontal or inter-usability [1], [9] addresses these issues by suggesting that applications keep up continuity by making the differences between interfaces as clear as possible. In this context, Grudin's [3] notion is very relevant: "Consistency is a trade-off against other goals: at times, it is not the best design strategy."

Dimensions of Cross-device Consistency

Consistency is best defined as a relation between aspects of the interface [4]. What are the dimensions that are needed to describe these relations? How can these dimensions inform the design of consistent interfaces? In this section the dimensions mentioned in literature, e.g. [4], are collected and integrated into a proposed classification scheme that will be a starting point for the workshop discussion.

The best known – if not the prototypical – form of consistency relations exists between design aspects of a single application on one platform. We refer to this relation as intra-application consistency. Consistency within an application can be considered as one of the classic aspects of consistency.

Intra-application consistency is a pre-requisite to any type of cross-platform consistency. In the scope of computing platforms compatibility of an application to platform-specific style guides, requirements, design and conventions is referred to as intra-platform or vertical consistency. Cross-platform or horizontal consistency on the other hand describes the relation between versions of a user interface or multiple user interfaces on different platforms.

Consistency affects all levels of man-machine communication [7]. While often presentation and lexical issues are in the main focus also higher levels such as task or semantics might be affected. Task consistency for instance describes the difference between the task models a user has in mind and the ways it is implemented on different devices.

The context of use in which applications are accessed determines another type of consistency relation. This process-oriented dimension determines the perspective of the user in the cross-platform situation, whether he is using an application on one comparing an instance with the image stored in his memory, or whether the active transience between devices is observed.

According to this summary we can define the following three dimensions to describe consistency in multi-device environments: s*cope* (the operands in the comparison, e.g., two devices); a*spect* (the level of man-machine interaction compared, e.g., presentation or syntactic level); and c*ontext* (the process that serves as operational environment affecting perception of its properties; e.g. during usage or in transition).

Evaluating and Using Consistency

Even though it is clear that consistency must be treated carefully in multi-device design, tools to evaluate consistent design are still likely to improve usability. While there are few approaches to evaluate classic inter-application consistency [5] potential methods addressing other scopes and aspects of multi-device consistency still are subject to research [2]. Further, the integration of such consistency measures into graphical design methods will have to be brought into practice.

Workshop Goal

The goal of this workshop is to bring together people from different disciplines and to give space for the discussion of the relevance of consistency, what the dimensions of consistency are, how those dimensions are related, and how they can be measured and exploited for more usable applications.

The workshop aims to find answers to the following questions:

- What (if any) aspects of consistency matter in cross-platform design? What evidence has been gathered to inform us? What are the biggest unknowns?
- What are unique problems for ensuring consistency in application interfaces that span multiple platforms?
- What are the limits of consistency? Under what circumstances do other concerns outweigh the desire for consistent design in cross-platform application design?
- How can consistency be evaluated in the multi-device context and how can such measures integrate into the design process?

At the conclusion of the workshop we hope to have:

- Identified areas of consensus and developed a preliminary set of guidelines for designing cross-platform applications/experiences.
- Identified the most needed and promising areas for further research.

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