Lessons Learned from Field Trials with Advanced Windows Mobile Phones

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1. INTRODUCTION

Advanced phones, such as Smartphones and Pocket PC phones, can be useful tools for real world field trials and data collection, because they have capable hardware, are inexpensive, and ready for everyday use. We have employed Windows Mobile Smartphones and Pocket PC phones in our research for more than a year. We employed these phones as measurement tools to sample the network conditions our subjects encountered in their daily life. We also conducted multiple field trials with these phones for usability studies. Our methods included *in situ* logging, *in situ* surveys, interviews, and focus groups. We present the lessons we have learned from this experience, in particular on the instrumentation of the phones and the use of human subjects.

2. DEVICE INSTRUMENTATION

There are powerful integrated developing environments (IDEs) for developing Windows Mobile applications, e.g. Visual Studio. However, the closed source nature of Windows presents a challenge for research that requires access to low-level system functions. Furthermore, OEMs can modify the Windows source code on their devices[1]; their device drivers and programming interfaces do not necessarily conform to recommendations set by Microsoft. Often, their SDKs and documentation are unavailable or too expensive for academic research and independent programmers. Therefore, we had to use trial-and-error, as well as to resort to online forums and weblogs for hacks. For example, we developed software that periodically records network conditions with minimal intrusion. The software must carefully manage the Wi-Fi interface to minimize its battery impact while respecting power management decisions by the user regarding the Wi-Fi interface and the phone as a whole. Without access to the source code for Wi-Fi interface driver and network protocols in general, we had to employ many awkward, ad hoc solutions. We believe an open-access mobile phone platform could facilitate instrumentation considerably.

3. THE USE OF HUMAN SUBJECTS

Advanced phones offer a wide range of applications and features beyond traditional phones. We found that they demand a long learning period. Only in the second month of usage had most of our subjects converged on their usage patterns, got used to certain features, or even found out about them. Further, our subjects rarely read the user manual we provided, and they expected the simplicity of their old phone yet the sophistication of a personal computer. However, advanced phones have relatively complex user interfaces and there are conceptual differences between similar functions on the phones and PCs. These confused our subjects and hindered their exploration of the phones. In addition, the large size and weight of the phones was a major discouraging factor for our subjects to explore advanced features, and the phone usage of our subjects showed considerable diversion from their regular phone usage.

We found that providing support and regular contact in person can greatly improve the subject's experience, expedite learning, and facilitate the study. As regard to research methods, we found that *in situ* logging and self report measures (interviews, surveys, and focus groups) provide complementary strength. In particular, our in situ logging was able to identify some of the inaccuracies in subjects' recounting of their usage. Our experience also showed that further research is required to improve subject cooperation in answering *in situ* surveys, i.e., questionnaires delivered in an event-driven fashion.

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[1] Microsoft's Shared Source Initiative allows OEM customers to access source code of Windows CE.