Characterizing Smartphone Usage: Diversity and End User Context

Tapio Soikkeli, Department of Communications and Networking, Aalto University, Aalto, Finland

Juuso Karikoski, Department of Communications and Networking, Aalto University, Aalto, Finland

Heikki Hämmäinen, Department of Communications and Networking, Aalto University, Aalto, Finland

ABSTRACT

Mobile end user context has gained increasing attention in the mobile services industry. This article utilizes handset-based data, collected from 140 users, to examine smartphone usage in different place-related end user contexts. Smartphone usage is examined first on a high level by using smartphone usage session as a unit of analysis. Then the usage sessions are dismantled into application sessions for deeper analysis and application level study. According to the authors’ analysis, smartphone usage is highly diversified across users. For example, the daily smartphone usage time differs by orders of magnitude between users. They observed also that smartphones are used differently in different end user contexts. For example, some applications are clearly more context sensitive than others. The results imply that mobile services and applications need to adapt to user behavior in order to be personalized enough, and that context awareness can indeed be a worthwhile step towards this.

Keywords: Application Session, Diversity, End User Context, Smartphone, Usage Session

INTRODUCTION

In the past few years the mobile device and mobile services markets have been affected by a strong emergence of smartphones. Smartphones are mobile phones that offer advanced computing abilities and connectivity options. Smartphones are programmable mobile devices, running complete operating systems in a manner similar to traditional computers. These features enable new kinds of mobile services that in turn shape the usage habits of smartphone users. As smartphones provide more and more applications for an increasingly wider range of usage situations, they become an increasingly integrated part of users’ everyday life. The programmability of smartphones gives a possibility to turn the devices into data collection platforms providing detailed information on users’ smartphone usage habits. The devices’
strong integration into users’ everyday lives gives a possibility to infer information also about the users’ other, everyday, habits. We have used handset-based measurements to collect rich smartphone usage data directly from handsets of the users. The data are used to detect place-related end user contexts, and to extract smartphone usage session and application session information.

End user context is seen as important information when trying to develop more personalized mobile services and applications. For example, Gartner (2011) predicts that by 2015 context, particularly centered on location, presence, and social interactions, will be “as influential to mobile consumer services and relationships as search engines are to the Web”. Detecting significant places meaningful to a user and end user contexts has gained more and more interest also in the academia. The potential value of context information lies in its possibilities to predict presumable differences in user behavior and usage habits related to the different contexts/situations of the user.

Smartphone usage sessions capture the user behavior and usage habits of a smartphone user on a high level. By dividing the usage sessions into application sessions we can study the structure of the usage sessions, as well as provide insight into the usage of individual applications. With the relatively comprehensive handset-based data which enable us to produce time-wise linked context and usage information we can examine the effects of context on smartphone usage.

The purpose of this article is to study smartphone usage habits of our handset-based data collection participants (i.e., panelists) by first describing the higher level smartphone usage through analysis of different smartphone usage session characteristics. After the higher level study we pursue deeper understanding of the usage habits by moving to application session level and the usage of individual applications. In both phases we consider the usage first in general and then in different end user contexts to acquire insight of the contextual patterns in smartphone usage.

Mobile end user context has been studied before with different methodologies, but inferring it from handset-based data is still a relatively new approach. The same applies to handset usage studies. This is due to the fact that handset-based data collection could not exist before the capabilities of handsets were at an adequate level (i.e., smartphones were in use). Thus the body of previous research around mobile end user context and overall smartphone usage is relatively slim and the external validity of the results is questionable due to relatively narrow datasets. This article contributes in providing new results for comparison by using own datasets and original methodology for end user context detection and smartphone usage session extraction.

The article is organized as follows. First, we go through some background and related literature. A central part of this is introducing the terms smartphone usage session, application session and end user context and explaining how they are defined and understood in this work. Second, the methodology and data used are described. Then, the results concerning smartphone usage sessions and application sessions in general, and in different end user contexts, are introduced and discussed. The final chapter concludes the paper.

BACKGROUND AND LITERATURE REVIEW

Programmability of smartphones has enabled researchers to collect smartphone usage data directly from the users’ handsets. One of the first of such data collection platforms, called ContextLogger, was developed by Raento et al. (2005). The platform has been used, for example, in the MIT’s Reality Mining project (Eagle & Pentland, 2006). More recently an increasing amount of similar data collection efforts have emerged both in the academia and in the industry (e.g., Shepard et al., 2010; Aad & Niemi, 2010; Kiukkonen et al., 2010). This article uses data collected in a similar effort (explained briefly in the next chapter).
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