

# 2<sup>nd</sup> Workshop on Research in the Large. Using App Stores, Wide Distribution Channels and Big Data in UbiComp Research

**Henriette Cramer, Mattias Rost**  
Mobile Life @ SICS  
Kista, Sweden  
{henriette, rost}  
@mobilelifecentre.org

**Frank Bentley**  
Motorola Mobility  
Libertyville, IL, USA  
f.bentley@motorola.com

**David A. Shamma**  
Yahoo! Research  
Santa Clara, CA, USA  
aymans@acm.org

## ABSTRACT

With the proliferation of app stores and the advancement of mobile devices, research that might have only been tested with a dozen participants in the past can now be released to millions. This offers huge opportunities, but also requires adaptations of existing methods in dealing with large deployments and making sense of large data sets. This workshop provides a forum for researchers to exchange experiences and strategies for wide distribution of applications as well as gathering and analyzing the large-scale data sets the result from these deployments.

**Author Keywords** research in the large, app stores, distribution channels, research methods, big data

**ACM Classification Keywords** H.5.2 User Interfaces: Evaluation/methodology

**General Terms** Experimentation, Human Factors

## INTRODUCTION

Both the proliferation of app stores and the advancement of mobile devices used by people in their daily lives has made reaching large audiences, and gathering large datasets from wide audiences for research purposes increasingly easy. With the growth of mobile app stores, research that might have only been tested with a dozen participants in the past can now be released to millions. This provides great opportunities for gathering data and conducting research on mobile usage and experience directly from a large section of the public in more naturalistic settings. Reaching wide audiences is now an attractive option in addressing specific research problems or in testing and improving application concepts. Indeed, an increasing number of researchers are taking advantage of the opportunities of wide deployments [e.g.6,8,9]. In addition, UbiComp related services are providing researchers with data sets or access to content via APIs and we now have the ability to obtain large amounts of data from new and existing service deployments. These large trials and access to such large data sets offer huge opportunities for the community, but ‘standard’ strategies and ways to overcome the challenges in infrastructure, data

validity and potential international and ethical issues inherent to wide deployment are not yet available. Tools, and standard strategies are not available to make sure that researchers fully understand the usage encoded in their datasets. During the first ‘Research in the Large’ workshop [3], it became evident that many challenges require community discussion and the development of shared strategies, protocols and tools. This workshop aims at providing a platform for researchers from both academia and industry to discuss these opportunities and challenges from their own perspectives and previous experiences. Together we will investigate which strategies work (and which do not) and the opportunities that wide deployment and large-scale data analysis bring.

## LARGE SCALE DEPLOYMENTS

Researchers are already taking advantage of the opportunities of large-scale deployments. For example, Schleicher et al.’s WorldCupinion [16] has been released to over 1000 users, a number that is impractical using traditional small-scale research recruiting and deployment methods. This scale enabled them to quantitatively study the usage of various application features and user drop off over time. Henze et al., [17] have created multiple mobile applications that have been distributed through application stores. Through large deployments, they have been able to better understand demographics and their impacts on use. They also explored opt-out and opt-in strategies for data collection and their implications on the amount of data that was collected. A selection of reoccurring issues are listed below.

## Business & promotion models

With an increase of users potentially comes large operating costs, costs of promotion in app stores, and additional tech support for users who may be experiencing issues. In turn, incentives may also be necessary to convince end-users to provide feedback that goes beyond automated log data. Because of these costs, distributing apps on a large scale often requires some sort of financial plan. The initial costs of wide deployments and dealing with large datasets may be low, but the upkeep of services and data gathering from potential millions of users can be significant. With the growing number of available applications, developers also need to deal with promoting their application and making

sure it reaches potential end-users. Presenting an application as a research prototype might infer a negative bias on the application, whereas presenting it as a commercial app might raise expectations of polish and robustness not often achieved by research prototypes. The multitude of such questions raised at our previous workshop [6], shows these are less trivial than they may appear.

#### **Informed, representative participants**

One of the recurring issues reported at the research in the large workshop is the difficulty in determining who the end-users of widely distributed research apps actually are [14]. International and intercultural issues may have to be taken into account [5]. In addition, when early demographics of an application or service are skewed, the generalizability of collected usage data comes into question. However, collecting accurate demographic data is often not trivial. McMillan et al., [7] have studied the official Apple App Store versus marketplaces for jailbroken phones and have seen different demographics of users and different patterns of adoption with users from each market. Dealing with large deployments and large datasets also poses questions on data privacy and ethics [1]. If end-users often do not read or understand end user agreements [4], do they understand that they and their data are part of a research trial?

#### **Large-scale data analysis**

Dealing with large-scale data requires different strategies. If a research app reaches thousands, or millions of users, gathering large-scale datasets becomes both a possibility and a challenge. Similar issues arise when we access existing data from other services via APIs. We need new ways to deal with these real-time, vast and ever-growing data sets. This requires new methods for selection, analysis and visualization on an unprecedented scale. To get an accurate view of use, sometimes we have to ‘throw data away’ and need sanitization strategies to deal with noise. We also need security measures to maintain integrity of our data (or the data of users of other services), avoid potential attacks and need to ensure proper anonymization of user data. Data tools also need to reflect both ‘the large and small’. Morrison and Chalmers for example have created the SGVis system for visualizing usage in large-scale deployments of mobile applications [8] allowing identifications of large trends and usage categories as well as digging into individual user behaviors. We need such tools, and additional strategies to combine large-scale data gathering with a deep understanding of how usage motivations may bias data; making sense of usage data can require smaller ethnographic-style studies or survey data. Perhaps design patterns, like Bernstein et al. [1] have begun to design for crowdsourcing, could inform the growing numbers of ‘app-store’ research collections with new interaction techniques, security methods, and data collection designs.

#### **WORKSHOP**

This workshop features contributions from developers and researchers from both industry and academia with experiences deploying mobile apps on a larger scale and dealing with large data sets. The expected outcome is an overview of the challenges and ways to overcome them, while also generating insight into new questions that present themselves when it comes to doing research in this dynamic landscape of app stores, markets, new devices and services. Participants are expected to take away practical strategies, tips and tricks in dealing with large deployments and big data – as well as taking advantage of the lessons learned by other researchers in such large-scale studies

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