Marie Curie – FMIA (255625)- Final Report

1. FINAL PUBLISHABLE SUMMARY REPORT

Mobile phones, once deemed as simple communications devices, now provide people with the ability to access a wealth of online information, anytime and anywhere. In the past few years in particular, mobile phones have started to dominate as the primary mode of accessing the Internet. This growth in popularity is due to a number of factors including: improved mobile broadband and mobile networks, the growing popularity of social networking, video services and VOIP services, as well as significant advances in mobile handset technology[1]. Recently, there has been a flurry of reports showcasing this growth. For example, a 2012 report by KPCB highlights that the mobile Internet is growing faster than the desktop Internet ever did[2]. A study published by Nielsen in 2010 shows that mobile Internet usage is increasing significantly, in particular among young people[3]. Furthermore, according to a report by Deloitte in 2011, more than 50% of computing devices sold globally will be smartphones, tablets and non-PC netbooks[4].

Despite this growth, the Mobile Internet represents a challenging information access environment due to a range of factors. Desktop-based and mobile-based information accesses are fundamentally different from each other and the unique challenges associated with mobile information access cannot be solved by merely translating desktop solutions to a mobile device as is commonly assumed.

Mobile phones are personal devices. They are always on and always with us. As such, our interactions with mobile handsets differ significantly from our interactions with desktop systems. In particular, mobile phones are characterized by limited screen real-estate and restricted input/interaction capabilities that make information access tasks challenging and cumbersome for end-users. Mobile users are also different from desktop users: they are on-the-move and are typically interested in locating different types of content. Furthermore, mobile users have information needs that are impacted by changing contexts such as location, time, social interactions and activity.

In order to build enriching, engaging mobile user experiences, we need to gain a more fundamental understand of the unique needs, intents and information access behaviors of mobile users. Unfortunately, our current understanding of the specific information needs that are intrinsic to mobile users is still limited. As such the main objective of the FMIA project is to gain a deeper understanding of the actual information needs and behaviors of mobile users and to enhance their online experience by making it easier for them to access information online via their mobile handsets.

1 Admob, "Mobile Metrics Report", 2010 See: http://bit.ly/b7DYFJ
2 KBCP, "Internet Trends", 2012 See, http://www.kpcb.com/insights/2012-internet-trends-update
3 Nielsen, "Mobile Youth Around The World", 2010 See, http://bit.ly/fzmCPK
4 Deloitte, "Technology Predictions 2011", 2011 See, http://bit.ly/fesYLW

Research Work and Results:

The main goal of the FMIA project was to increase our fundamental understanding of today's mobile users, to use the lessons learned from user studies of mobile users to outline concrete design implications for engaging or enriching future mobile information access experiences and to produce high-quality research results and

subsequently publish them in top-tier scientific conferences so that we may have an impact of the scientific community.

Over the two year period the researcher has conducted 4 live field studies and 1 mobile query log analysis study in order to advance our understanding of today's mobile users, their daily information needs and the mobile Web behaviors. The researcher has also used the learning outcomes from some of these studies to design and build a proof-of-concept mobile prototype to support social, shared mobile search experiences which was evaluated in-the-wild. During this 2-year period, the key results achieved are as follows:

a) The researcher devised, implemented and deployed a novel methodology for studying mobile users while on-the-move.
b) The researcher carried out a study of daily information needs that revealed new insights regarding the types of information needs that occur in people´s lives, how they address those information needs and the role that mobile technology plays on the needs that arise and the mode used to address those needs. This study not only complements earlier work in this domain, but provides new findings regarding daily information needs that end-users have difficulty in addressing with existing services.
c) The researcher's user-centric study of mobile Web and mobile search behaviors showcases new results regarding the key motivators and situations in which mobile search is used by active smartphone users.
d) The researcher's study of social mobile search behaviors highlighted that the use of mobile search in social, co-located settings to satisfying shared needs for information is increasing. This study suggested that existing mobile search services lack appropriate means of sharing web content.
e) The researcher designed, implemented and evaluated a novel proof-of-concept prototype aimed to enrich shared mobile search experiences in co-located mobile settings.
f) The researcher discovered important design implications that should help researchers in designing future social mobile systems.
g) The researcher's study of existing mobile search patterns (via query log analysis) highlights that mobile search patterns are evolving but some differences exist between android and iPhone users, thus implying that customization or personalization might be needed, depending on device type.
h) The research results obtained through the FMIA Marie Curie Fellowship have been published at top-tier, peer-reviewed international conferences and workshops in fields related to the World Wide Web, HCI, Mobile Computing and Information Retrieval.

Final Results and Potential Impact:
The overall research in FMIA has the potential to advance the state-of-the-art in the following ways:
a) The researcher has provided new insights on mobile users, their needs, intents, contexts and information access behaviors. This research should be of interest and relevant to other telecommunications providers, major search engine providers, and researchers working in the mobile space.
b) The researcher has proposed several design implications that should help in the designing of future mobile search services. This should be of interest to mobile designers, mobile developers and mobile innovators.
c) The researcher has presented a novel approach to conducting user studies in the wild that could help fellow researchers in understanding mobile users in the wild. She is currently working on a modular implementation of this method

that will be used in-house to conduct further experiments. She also hopes to write a method paper to show students how to conduct such research.

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2. USE AND DISSEMINATION OF FOREGROUND Section A (public) – DISSEMINATION MEASURES

The dissemination measures of the FMIA fellowship related mainly to scientific publications, active participation in the mobile research community and associated conferences, and finally internal/external talks.

Publications:
All the research methods and results have been published scientifically or are currently under review.

1. *Church, K. and Oliver N. (2011) Understanding Mobile Web and Mobile Search Use in Today's Dynamic Mobile Landscape. In Proceedings of the 13th International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI'11). ACM*

2. *Church, K., Cherubini, M., Neumann, J. and Oliver N. (2011) Understanding Mobile Information Needs on a Large-Scale: Tools, Experiences and Challenges. In 2nd Research in the Large Workshop (held as part of UbiComp '11).*

3. *Church, K. and Oliver N. (2011) Understanding Portal-Based Mobile Search: a Case Study. In 2nd Research in the Large Workshop (held as part of UbiComp '11).*

4. *Church, K. Cousin, A. and Oliver N. (2012) I Wanted to Settle a Bet! – Understanding Why and How People Use Mobile Search in Social Settings. In Proceedings of the 14th International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI'12). ACM*

5. *Reis, S., Church, K. and Oliver N. (2012) Rethinking mobile search: towards casual, shared, social mobile search experiences. In Searching 4 Fun Workshop (held as part of ECIR'12).*

6. *Karatzoglou, A., Baltrunas, L., Church, K. and Böhmer, M. (2012) Climbing the App Wall: Enabling Mobile App Discovery through Context-Aware Recommendations. In Proceedings of the 21st International Conference on Information and Knowledge Management (CIKM'12). ACM*

7. *Church, K. (2013) Exploring the social side to mobile search, Book contribution, In Designing the Search Experience. The Information Architecture of Discovery by Tony Russell-Rose and Tyler Tate. Morgan Kaufmann , Jan 2013*

8. *Reis, S. and Church K. Insights into co-located shared mobile search, Submitted to CHI 2013, ACM. Currently under review*

9. *Church, K, Cherubini, M and Oliver, N. A large-scale study of daily information needs. Under revision for TOCHI journal. ACM.*

Dissemination activities

Aside from the publications above, the dissemination activities included attendance to relevant conferences and workshops, workshop organization, tutorial presentations, external talks at other research labs and internal talks within Telefonica.

Conference/Workshop Attendance:
- Mobile World Congress, Barcelona, February 2011
- UbiComp, Beijing, China, September 2011
- Social Mobile Web Workshop, Barcelona, July 2011 (part of ICWSM 2011)
- Searching 4 Fun workshop, part of ECIR 2012, Barcelona, Spain, April 2012
- RecSys, Dublin, Ireland, October 2012
- MobileHCI, San Francisco, USA, September 2012

Organizing Research Events:

In July 2011, the researcher co-chaired and co-organized the 3rd Workshop on the **Social Mobile Web,** which was held as part of ICWSM 2011 in Barcelona in July. It was a full-day workshop with 8 papers accepted covering a range of topics. The workshop's keynote speech was given by Erik Schultink, CTO of Tuenti, one of Spain's largest online social networks. The researcher's fellow co-organizes were Josep M. Pujol who at the time was a researcher in Telefonica Research, Barry Smyth a professor at University College Dublin and Noshir Contractor a professor at Northwestern University, USA: http://thesocialmobileweb.org/

The second full-day workshop, called **"Mobility and Web Behaviors"** was organized with Matt Jones from University of Swansea and Jaime Teevan from Microsoft Research and took place at MobileHCI 2012 in San Francisco. The goal of this workshop was to investigate the notion of mobility in the context of Web search and Web usage and to identify the most promising research directions with respect to enriching future mobility focused Web services. The workshop's keynote speech was given by Scott Jenson, Head of Design, at Parlay Labs. There were 6 short paper presentations and an invited panel which comprised of leaders in the industrial and / or academic research domain: http://mm2.tid.es/mwb2012/program.html

The third full-day workshop, called **"Personalizing the Local Mobile Experience"** was organized with Henriette Cramer of Mobile Life (now Yahoo! Labs), Neal Lathia of University of Cambridge and Daniele Quercia of University of Cambridge (now Yahoo! Labs) and took place at RecSys 2012 in Dublin, Ireland. The motivation for this workshop was the growing popularity of location-enabled mobile phones and location-based services, which offer a great opportunity to apply personalization and recommender system technology to people's everyday lives. The workshop started with an industry keynote from Francesco Calabrese of IBM Research, Dublin. Then there were 5 short paper presentations. In the afternoon an existing location-based recommendation service (FourSquare Explore) was explored by the attendees outdoors in Dublin city. The workshop finished with a brainstorming session, where we shared our findings and outlined a set of open research questions. More details here: http://loca.mobilelifecentre.org/

Tutorials:
The researcher was invited to give an industry focused tutorial on "**Designing and deploying mobile user studies in the wild: a practical guide**" at MobileHCI 2012. The goal was to provide practical instructions and guidelines to designing and deploying mobile field studies, based on the learning outcomes we have gathered in Telefonica

I+D over the past few years. The tutorial attracted 25-30 participants from a diverse range of fields. The participants included UX researchers, UX specialists as well as designers from Google, Oracle, Ferrari, Boeing and KeneXa, as well as a number of researchers working in or interested in the mobile space, either in the early stages of the PhD or at post-doctoral level. The tutorial was highly interactive with lots of questions and discussion about how participants currently approach mobile field studies, what works/doesn't work and how we can improve this process moving forward.

Website: http://mm2.tid.es/mhcitutorial/objectives.html

External Talks:
The researcher visited and gave invited external talks throughout 2012. In each visit, she presented the results of our large-scale study of daily information needs.
1. **AI and HCI Lab, EPFL, Switzerland, February 2012**
2. **HCI group, St. Andrews University, Scotland, March 2012**
3. **Multimodal Interaction Group, University of Glasgow, Scotland, March 2012**

Internal Talks:

- Talk: *Study of Mobile Information Needs* at Telefonica I+D Barcelona, 1st December 2011
- Talk: *Study of Mobile Information Needs: Results and Service Opportunities*, to Future Communications group, Telefonica I+D, Madrid, 28th November 2011
- Talk: *Study of Mobile Information Needs: Results and Service Opportunities*, to User Experience (UX) team, Telefonica I+D, Madrid, 29th November 2011