Research Methods in Informal and Mobile Learning

Book of Abstracts

WLE Centre
14th December 2007

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MIL-RM 2007

Proceedings of the Workshop:
Research Methods in Mobile and Informal
Learning How to get the data we really want

14 December 2007
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Learner Centred Design: Applying MobileHCI and Mobile Design Research Methods in Mobile and Informal Learning Contexts

This paper is a survey of research and design methodologies used for understanding individual (human) mobile behaviour used by developers within the MobileHCI (Human Computer Interaction) and Mobile Design research communities. This paper summarizes the most commonly used and emerging research methodologies and suggests which methodologies are ideally suited for researchers within informal and mobile learning contexts to help garner the crucial data to help make informed decisions about the design of learner-centred informal and mobile learning environments.

1. Introduction

The purpose of this paper is to briefly survey research methods from Mobile Human Computer Interaction (MobileHCI) and Mobile Design research to ascertain if research methods from these disciplines could effectively be transferred to Mobile Learning and Informal Learning Design research. Furthermore, this paper should be viewed as an attempt to make a small contribution to help enhance existing research methods and help inspire the development of new and novel research methods for the Mobile Learning and Informal Learning Design communities.

The methods highlighted in this paper have been chosen on the basis that they could assist in collecting useful, if not crucial, data in order to assist in the evaluation of the effectiveness of mobile learning and informal learning scenarios. The crucial data in question refers to any data that accurately measures the effectiveness of mobile and informal learning scenarios. Therefore, the crucial data sought by Mobile Learning and Informal Learning Design Researcher can be revealed through the application of well-suited methodologies that potentially help garner the key data that will help make informed decisions about current and future designs of learner-centred informal and mobile learning environments and scenarios.

The research conducted for this paper is exploratory in nature, and thus, will not be able to cover in depth many of the methodologies, concepts and topics surveyed. It is helpful to view this work as a medium to encourage thoughtful discourse and to continue an ongoing dialogue regarding how MobileHCI and Mobile Design research methodologies can be implemented by Informal and Mobile Learning Researchers to gain the crucial data to help inform how individuals learn within the context of mobility and informal learning contexts.

1.1. The Context of Mobile and Informal Learning Research

One of the greatest challenges

facing Informal and Mobile Learning Researchers is gathering large sets of quantitative and qualitative data from various observable and non-observable phenomena within a specific context or setting. The purpose of gathering such data can be seen as crucial in helping to evaluate the appropriateness and effectiveness of informal learning and mobile learning scenarios. Additionally, due to the ubiquitous and pervasive nature of mobile and informal learning it is no easy task to conduct quantitative research in natural and context specific settings with large numbers of study participants. Therefore, it is essential to identify and apply the most effective and appropriate research methodologies in order to achieve the desired results of gathering useful data within a specific setting and context. Bearing this challenge in mind let us reflect and ask what research methods can help Mobile Learning and Informal Learning Design Researchers gather the data needed?

According to Jensen & Skov (2005) it is useful to investigate research methods derived from different disciplines as these research methods can help inform on future directions and influences on a particular discipline. This paper argues that the research methodologies of Mobile HCI and Mobile Design are ideally suited to Mobile Learning and Informal Learning Design and will help face the challenge of gathering large sets of quantitative and qualitative data within a natural setting and context in order to evaluate the effectiveness and appropriateness of informal learning and mobile learning scenarios.

1.2. Real world learning

It can be observed that recent advances in mobile information and communication technologies have not only increased individual mobility, but have empowered and enabled individuals to harness mobile technologies for the purpose of using them to augment and enhance formal and informal learning contexts. Smaller more powerful mobile devices with network connectivity are enabling individuals to engage in novel learning situations that are not easily observable due to the ubiquitous and pervasive nature of informal and mobile learning contexts. Additionally, it can be argued that the very mobile information and communication technologies that enable these new modalities of learning can also be used to help Researchers observe and gather data on informal and mobile learning scenarios.

Many MobileHCI and Mobile Design research methods harness the mobile technologies and engaged the users themselves to assist in the evaluation of the accessibility, usability, and appropriateness of mobile devices and services. Therefore, one of the unique characteristics of the very technologies associated with Mobile Learning and Informal Learning is that the technologies used can be harnessed to help Mobile Learning and Informal Learning Design Researchers conduct large-scale quantitative research to help gather important

(crucial) data from real world mobile and informal learning scenarios which will could ultimately help broaden and advance current methodologies used to evaluate informal and mobile learning contexts.

2. Harnessing MobileHCI Research Methods

The following MobileHCI and Mobile Design research methods highlighted are grounded within the methodological theories of: Action Research, Ethno-methodology, Participatory Design and User Centred Design, which can be harnessed by Informal and Mobile Learning Researchers in order to gain the data which will inform the effectiveness of mobile learning and help evaluate informal learning situations. The "different research methods have been adapted in research projects ( ). This is no different than other disciplines, but it is important to understand how research methods have been adapted in different disciplines as it potentially informs us on future directions and influences on the discipline (Kjedskov & Graham, 2003). Wynekoop & Congor (1990) have conducted a review of research methods in which they created a classification scheme to help in their analysis. A summary of existing MobileHCI /Mobile Design research methods (See Table 1.) has been adapted from the research of Kjedskov & Graham (2003), and Jensen & Skov (2005) to reflect the Wynekoop & Congor classification of the most common research methodologies. This summary highlights the strengths, weaknesses and uses of various methods based upon the

Environment:	Method:	Strengths:	Weaknesses:	Use:
Natural Setting	Case Studies	Natural setting, Rich data	Time consuming, Cannot be generalized	Descriptions, explanations, developing hypothesis
	Field Studies	Natural Settings, Replicable	Difficult data collection, Unknown sample bias	Studying current practice, Evaluating new practices
	Action Research	First-hand experience, Applying theory to practice	Ethics, bias, time consuming, Cannot be generalized	Generation & Testing of Theories / Hypotheses
Artificial Setting				
	Laboratory Experiments	Control over variables, Replicable	Limited realism, Cannot be generalized	Controlled experiments, Theory/Scenario testing
Environment Independent	Survey research	Easy, low cost, can reduce sample bias		
	Applied Research	Learning scenarios can be evaluated	May need further design to make learning scenario applicable	Scenario development, testing hypothesis and concepts
	Basic Research	No restrictions on solutions, Solve new problems	Costly, time demanding, may produce no solution	Theory building
	Normative writings	Insight into first-hand experience	Opinions may influence outcome	Descriptions of practice, building frameworks

Table 1. Summary of existing research methods. (Adapted from Kjedskov & Graham, and Jensen & Skov)

environmental setting the research is conducted.

The research of Hagen, Robertson, Kan and Sadler (2005) demonstrates the emergence of new research methods used within the MobileHCI and Mobile Design communities. These methods are categorised and presented as an extension and combination of existing MobileHCI and Mobile Design research methods that evaluate mobile technology usage. Three main categories highlighted in their research "represent various approaches to accessing and making available data about different aspects of mobile technology use, (and) entail different roles and responsibilities for both researchers and participants." (Hagen 2005)

The following three categories are as follows and have been annotated to apply to a learner centred context and setting:

1. Mediated Data Collection: In which participants (learners) and mobile technologies mediate data collection about use in natural settings and situated learning context.

2. Simulations and Enactments: simulations and enactments are used to make available

experiential information sensitized to real contexts of use.

3. Combinations: existing methods, and/or mediated data collection and/or simulations and enactments are combined to allow access to complementary data. (Hagen, 2005)

A summary of the above mentioned approaches are highlighted below (See Table 2.) including the description and derivation of use from established methods from which these new approaches are borne.

The above summary of existing and emerging research methods used by the MobileHCI and Mobile Design communities highlights many new and novel approaches in acquiring quantitative and qualitative data in order to evaluate mobile technology usage. In conclusion, the question remains as to why and to what extent and under what circumstances are the specific MobileHCI and Mobile Design research methods and approaches are (or, are not) transferable to the research conducted by the Mobile Learning and Informal Learning Design communities.

APPROACH:	DESCRIPTION:	DERIVED FROM:
Mediated Data Collection	Where access to data about actual use practices is mediated by both Learner & technology combined	
• Learner-centred	Learners conduct the data collection using mobile devices.	Self-reporting, Diaries, Probes
• Automated	Learners engage in learning (m-learning scenarios) while data about use, content and metadata is logged automatically	Use/Data logs
• Mobile recording	Learners go about their normal routines while wearing sensors or cameras.	Video-observation, Use/Data logs
Simulations & Enactments	Methods for allowing immersive scenarios in which data about existing or potential use is accessed through some form of pretending.	
• Simulations	Physical, ergonomic or environmental props are used within a controlled environment in order to simulate m-learning scenarios.	Lab tests, Scenarios, Heuristics, Prototypes, Emulators, Simulators
• Enactments	Mobile-learning scenarios are played out through visual imagery or storytelling in order to observe potential outcomes.	Prototyping Scenarios, Role-playing, Work shopping, Storyboarding
Combinations	Various established and/or new methods are combined to enable access to complementary data.	

Table 2. Emerging Research Methods in MobileHCI. (Adapted from Hagen, et.al.).

3. Conclusion

This paper has briefly surveyed research methodologies from the fields of MobileHCI and Mobile Design in order to suggest and evaluate the applicability of these methods to Mobile Learning and Informal Learning Design research. In order to determine if research methods from MobileHCI and Mobile Design could effectively be transferred to Mobile Learning and Informal Learning Design research it is important to question as to why and to what extent and under what circumstances are MobileHCI and Mobile Design research methods and approaches transferable to Mobile Learning and Informal Learning Design research. Furthermore, it is important to question which specific criteria can be used to judge transferability and investigate if there are specific reasons why MobileHCI and Mobile Design methods would not be transferable to Mobile Learning and Informal Learning Design? This paper will not be able to address these questions here at this time, but encourages further evaluation in subsequent papers in order to properly evaluate the transferability of the methods survey to the repertoire of Mobile Learning and Informal Learning Design research methods and approaches.

What is special about Mobile Learning and Informal Learning Design research in relation to MobileHCI and Mobile Design is the element of an embedded pedagogy (or learning design) inherent in the learning scenarios evaluated. One of the primary goals of Mobile Learning and Informal Learning Design research is to evaluate the learning and developmental outcomes of the individuals. Bearing this in mind it is possible that MobileHCI and Mobile Design methodologies are more suited to informing and evaluating aspects of usability and accessibility issues, but cannot truly evaluate learning and developmental outcomes of individuals.

The importance of highlighting current and emerging MobileHCI and Mobile Design research methods is that they are grounded within the methodological theories of: Action Research, Ethno-methodology, Participatory Design and User Centred Design, which can be easily adopted, adapted and augmented into Mobile Learning and Informal Learning Design research. The flexibility of choosing research methods derived from different disciplines may open new doors to help gather the crucial quantitative and qualitative data needed in order to properly evaluate the effectiveness of informal and mobile learning scenarios; which ultimately will place the learners at the centre of research and design and help them achieve their learning and developmental goals through the appropriate informal and mobile learning scenarios.

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