Information Ecologies – A useful approach for observing 'mobile learning in the wild'?

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ABSTRACT
This working paper considers the usefulness of Information Ecologies (Nardi & O'Day, 1999) as a conceptual lens with which to view mobile learning in the wild. The research project was conducted using an ethnographic approach and considers the learning processes and challenges that postgraduates students faced while collecting data during a geographic information systems field trip. Finding a suitable approach from which to examine the issues that arose and audiovisual data created has been challenging. Several approaches have been considered but none allowed the flexibility required. However information ecologies seems to fits this setting's needs and this approach is currently being used for analysis to see what it can elucidate about the setting and processes within it. This paper will briefly outline the challenges faced in selecting a suitable conceptual framework for this novel setting, which observes learning with mobile devices. It summarizes the reasons why both constructivist and cognitive approaches were ill suited to this setting. The concept of information ecologies is explained and its limitations discussed. The paper concludes with a proposed route to harness this approach for this setting, and hence how it might benefit work in this area.

Author Keywords
Mobile learning, field trips, Information Ecologies

INTRODUCTION
This paper contributes to the area of mobile learning research by providing an examination of an underused approach (ecologies) to a setting where mobile learning is becoming increasingly common – learning in the semi-formal educational context of a field trip. A field trip has unique characteristics such as the opportunity for real world contextualization of case based problems and interactions with the natural world. However these also provide challenges for the learners to overcome especially when when interacting with the world via a digital device. It can often be difficult to capture the rich detail of what is being observed with such devices – a problem that both the students and researcher faced during this project. The ecological approach is gaining some popularity in an area where a social constructivist approaches has been fairly dominant please see (Pachler et al., 2010). This work is using the conceptual framework of Information Ecologies, which was developed by Nardi, and O'Day (1999) to deal with the complexities faced by communities who were using new technologies. Their work did not consider mobile technology, which at that time was not ubiquitous; hence this conceptual approach is being extended to this technology. It seems to be a promising lens with which to examine how the various actors, technology and the environment came together in this semi-formal learning setting and how their relationships were shaped. This could be a valuable way how communities integrate mobile technologies and use it to inform design for learning. Initially the characteristics of mobile learning on field trips are considered before examining information ecologies in more depth and how it will be applied.

MOBILE LEARNING ON FIELD TRIPS
The field trip setting displays unique characteristics – making it a novel setting in comparison a more formal academic setting. Most often field trips are conducted in real world settings and interact with the local environment. These educational contexts are short lived, artificial and intensely social events. The students often look forward to taking part in field trips as they enjoy the new setting, social aspects and different style of learning and teaching that are inherent in this context. Field trips can be a day out or they can be residential – those observed during this project where the latter. In this situation students and staff are required to cohabit (to varying degrees depending upon the logistics) and this produces interesting social dynamics. While this research was privilege to this, the focus was upon the learning journeys taken by the students during the projects set on the field trip. Several problems within a case based approach were posed and the students worked in groups to conduct their own research project to examine these problems. Mobile devices were an implicit part of these projects hence the focus was upon the roles the devices played, how the students interacted with them and around them during the course of their project. A theoretical approach was needed to frame these observations in their social context and examine the learning processes. However field trips are real world, albeit artificially contrived, intense but short lived, physically as well as mentally challenging, semi-informal in their educational format, dynamic and mobile across contexts both socially and educationally. In short they are not often an easy fit to many approaches and not comparable to other educational situations.

The project's educational setting consisted of residential postgraduate field trips in geographic information systems (GIS). This research project was an ESRC funded studentship linked to the Teaching and Learning Research Programme (http://www.tlrp.org/) Technology Enhanced Learning projects (http://www.tel.ac.uk/). The aim was to observe how the learning processes were influenced by the use of mobile technology on field trips. The students completed case-based projects in the field where they had to design and conduct mini project mobile devices to collect their field data. The mobile devices were specialist GPS enabled GIS devices which are essential for collecting data on the field trips. As the students were mostly inexperienced in using this technology the field trip was an opportunity to experience data collection in a real world context to discover the inherent issues in this activity and how these can influence the later data analysis in the context of their research mini project. However many smartphones are now capable of collecting this type of data. This became apparent in the final field trip in 2010 where the balance seemed to be shifting towards preferring personal devices however this is further discussed elsewhere (Beddall-Hill, 2011). The students were faced with the task of learning to use different devices but also at times incorporated their own personal mobile technology. It was interesting to observe how the students negotiated the challenges in operating and using these devices in a field setting where they did not always have direct access to staff for support. The difficulty of framing field trip settings has frequently been debated due to their contradictions. In this setting the role technology played was extremely important and hence an approach was needed which reflected this.

ECOLOGIES AND INFORMATION ECOLOGIES

While the ecological paradigm originates from within the biological sciences it must be applied extensively to other settings where fluid interrelationships are the focus. Applications of the ecological perspective include cultural ecology, semiotic ecology and Gibson's (1979) ecological approach to perception. These take a macro viewpoint of the world and how we interact with it. Although the ecological paradigm has also been used to observe micro systems in particular institutional settings and also the effects of technology upon our social worlds (Brown, 2000). Both Brown (2000) and Frielick (2004) propose using an ecological perspective to view learning within the technological age. Freilick's (2004:328) key idea is that "teaching/learning is an ecosystemic process of transforming information into knowledge, in which teacher, subject and student relationships are embedded or situated in a context where complex interacting influences shape the quality of learning outcomes". Freilick (2004) suggests we need to 'de-learn' in this new setting and Brown (2000) suggests we need new skills such as digital navigation and bricolage to build what is needed from digital media. These adaptations are less useful to this research setting as they are highly contextualised within a virtual environment (e-learning online) and not real world.

Nardi and O'Day (1999:49) use ecologies as a metaphor to observe the interactions of people and technologies in local setting. They define Information Ecology as "a system of people, practices, values, and technologies in a particular local environment". They developed this approach from ethnographic observations mainly conducted within Silicon Valley in this era. Information ecologies enjoyed some fame within knowledge management Davenport & Prusak, 1997) computer science (Nardi & O'Day, 1999) and library science in the late nineties. At this time it was a useful term for these areas to try to understand the changes that technology was bringing to work places through the use of metaphors while still privileging the people involved.

The key aspects of ecologies according to Nardi and O'Day (1999) are as follows:

An ecology responds to local environmental changes and local interventions. An ecology is a place that is scaled to individuals. We can all name the ecologies we belong to and participate in. In an ecology, we are not cogs in a sweeping sociological process. Instead, we are individuals with real relationships to other individuals. The scale of an ecology allows us to find individual points of leverage, ways into the system, and avenues for intervention. (p. 50)

Nardi and O'Day (1999) focus upon the human practices that are served by technology, proposing that microenvironments such as hospitals and libraries are information ecologies. In these settings people, technology and other artifacts come together in congenial relationships that are driven by the values that are present in that ecology. Both the people and the context supply the values – in a hospital it would be providing care while in a library an information service. Ecologies are used in a metaphorical sense to represent complex diversity where many relationships are taking place and most importantly they are continually evolving. They are a system which fit together. Within a hospital this could be the different roles that doctors, nurses and administrators play to provide care. There is also an urgency portrayed by ecologies because there is the possibility of failure due to environmental issues (Nardi & O'Day,1999). However breakdown or failure need not be the end of ecology. In nature ecologies are constantly renewing and rebuilding themselves once they have evolved to cope with the new demands placed upon them. For Nardi and O'Day ecologies provide a set of concepts with which to view a setting but most importantly they urge the members of that ecology to use the knowledge these provide to directly participate in developing that ecology to help it grow and thrive.

Limitations of the information ecologies approach

Using an ecological approach outside biological science raises some interesting questions – such as whether we can look at the social world in a similar systemic way to the biological one that was founded upon empirical research. Essentially we are retrofitting these concepts to a setting where we are using fundamentally different types of research designs and collecting different types of data. It could be argued that because we are using these concepts in a metaphorical way the

conflicts are reduced. Nevertheless using a cyclic approach can be difficult to enter as where does it start? It is unlikely to contain only one cycle but instead have a network of different niches with different interrelationships. When specifically considering the information ecologies approach Fedorowicz et al. (2004) suggests we consider time frames and the nature of human choices and interventions. When applying natural science theories to social science settings time frames are dramatically different. Within biological systems time is considered over decades whereas within this setting we are considering only a week. Fedorowicz et al. (2004) state that it is necessary to give time frame and clearly explain the methodologies used and data collected to allow others to form their own opinions around the nature of the changes that were observed. Furthermore individuals influence the settings through active decisions and by exercising our values – this does not occur in the same way within nature's ecologies. From an methodological standpoint ecologies reflect a systems approach that could be considered reductionist and might not elucidate the contradictions that ethnographies can reveal. However Nardi and O'Day (1999) use the systems approach as a framing and provide a reflective account of their observations where contradictions can be highlighted when necessary.

The use of the ecological approach has been more limited in education in comparison to the social cognitive and constructivist approaches. Furthermore the application of information ecologies has been inactive since the early 2000's. All societies and hence ecologies develop at different rates so care is needed as this framework was developed in within a different time and place to the field trip setting therefore parts of it may not be a good fit. The concept arose from ethnographies within Silicon Valley in the nineties so it could be considered technologically dated. Yet it was developed because Nardi and O'Day (1999) were concerned with the "Anytime, Anywhere" phase, which even at that time was the mantra of Silicon Valley and its workers (1999:209). They questioned whether we want to place such a demand upon ourselves. Do we need to be more efficient at everything, all the time? In thinking along these lines they encourage individuals to question their ecologies. They suggest asking 'know-why' as well as 'know-how' questions. This is particularly relevant to this setting where mobile technologies are becoming ubiquitous – why and what are the implications of this technology, not just what are the best ways to use it. Nardi and O'Day did not consider mobile technologies so this would be an interesting opportunity to apply an approach built to explore and empower those undergoing a huge technological change (the world wide web and personal computers) to a similarly momentous development – mobile technology.

INFORMATION ECOLOGIES AND MOBILE LEARNING ON FIELD TRIPS

The field trip could be considered an information ecology as it is filled with social interaction, technology and shared values (a system of interrelationships that affect each other). A diverse group of individuals are involved who bring different experiences and motivations. They might inhabit niches of the area or be relatively new to the wider ecology of the discipline. The values focus on experiential learning and achievement of the necessary requirements for successful assessment. Equally it could be argued that the members of a field trip group try to enable an enjoyable experience for themselves and others. It occurs in a set locality which is dependant upon the destination and an ecology grows specifically to meet the needs of that setting and group. The individuals adapt or evolve their practices to fit the setting for the short time they spend as a collaborative working social group. Technologies are present but at the forefront are the educational experiences and learning processes of the students – who are given freedom in how they use the technology. This allows them to experiment and shape their group practices as needed to respond to the environmental (how the data is collected) and educational challenges (what data is needed to resolve the research problem they were posed).

Importance should be placed upon the relationships between people, practices and tools not just the technology present as the driving force within the setting. Nardi and O'Day (1999) encourage researchers to look beyond the formal accounts of the practices within the settings, instead concentrating on the informal impromptu practices that take place. These may be processes that are not made explicit but contribute to the success of the activity. Within field trips this could be the social interaction and individual experiences that each group member brings to the problems they face. These kinds of practices are often not elucidated within research observing fieldwork with technology. How these impromptu and discovery practices shape the use of the technology and demonstrate how mobile fieldwork ecologies continue to develop and advance during their short thriving periods. Having knowledge of these could enable a practitioner to discover new avenues of intervention and produce options for designing with technology.

Applying information ecologies to mobile learning on field trips

Questioning of technologies before they enter the field trip ecologies could reduce problems such as learning lag and using technologically dated equipment or software. Nardi and O'Day (1999) suggest using a strategic questioning framework to identify different families of questions to led discussions of information ecologies. They believe these questions can be adapted to any information ecology; this questioning is intended to extend the analysis of this mobile learning field trip. Initially a rich picture analysis was used to map out the ecologies then thematic analysis is being used to identify the key themes present in this setting. Yet questions about the ecologies could enable deeper analysis of the processes, which are behind these themes.

Firstly there are questions that describe the issue; these will help address the first research question of what is going on in this setting. They consider the motivations and opinions within the setting (analysis) so what is the goal of using mobile technology on field trips. What can be seen (observation), how the students are using the mobile technology. The key

facts (focus) what mobile technology is being used and when. Finally feelings questions such as how the students felt about the mobile technology used in these ecologies. The second set of questions dig deeper and are useful for investigating practices to suggest change. The researcher was an observer and not a key member of the ecologies within the field trips, these questions are to be approached but from the researcher's perspective instead of a member of the ecology. These questions include – what might we alter to enhance the use of mobile technology on field trips (change), what if the students used their own mobile devices (alternatives), what might the consequences be if we let students use their own technology (consequences), what could hinder this approach (obstacles)?

Previous work has concentrated upon how we use mobile technologies in such settings (Priestnall et al., 2009, Stott, 2007) but has not questioned when and why it is most appropriate for use. A further consideration is whether we use one technology or device over another, in the case of field trips and increasingly within education generally this is the use of personal devices over institutionally provided devices. By thoroughly questioning the use of the mobile technologies present in this setting hopefully some insight will be provided for educators who engage in similar ecologies when considering how they might better shape them. It also begs the question of how much control we have over personal technologies entering our ecologies due to their inherent mobility, hence how they might be best used and managed is perhaps essential to consider. An ecology is unique and hence while the results of this work hope to provide a case of this in use with mobile technologies, it will only be useful as guidance as it is limited to this setting and one outsider's perspective. Nardi and O'Day (1999) state, that no single member can have enough knowledge of the information ecology to ask the right questions or give the depth for answers required, every member's point of view is valid and could aid the development of the ecology to meet the values of that group. The questions posed in this working paper are intended for development as the analysis progresses and this study will not attempt to answer all types of questions that Nardi and O'Day (1999) suggest. Instead it is more interested in using Information ecologies to aid a metaphorical description of the complex web of people, tools and practices observed within this novel setting.

CONCLUSIONS

The use of ecological frameworks is fairly common within academia (Frielick, 2004) and more recently beginning to gain favour within mobile learning contexts (Pachler et al., 2010). Information ecologies compared to the other approaches considered retains an open approach to viewing the setting, looking at the system of individuals and technologies while placing emphasis on the individuals and not the technology. It encourages a way of viewing the setting, which would enable direct participation for change thereby empowering the users. Despite being dated this approach could be extended to the use of mobile technology. It may be further utilised in the uncovering of informal practices occurring on field trips around mobile technology and how this information could be used to consider the bigger questions of why it should be used not just how it should be used.

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