Situated Knowledge in Context-Aware Computing: A Sequential Multimethod Study of In-Car Navigation

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ABSTRACT

A central feature of ubiquitous computing applications is their capability to automatically react on context changes so as to support users in their mobility. Such context awareness relies on models of specific use contexts, embedded in ubiquitous computing environments. However, since most such models are based merely on location and identity parameters, context-aware applications seldom cater for users’ situated knowledge and experience of specific contexts. This is a general user problem in well-known, but yet dynamic, user environments. Drawing on a sequential multimethod study of in-car navigation, this paper explores the role of situated knowledge in designing and using context-aware applications. This focus is motivated by the current lack of empirical investigations of context-aware applications in actual use settings. In-car navigation systems are a type of context-aware application that includes a set of contextual parameters for supporting route guidance in a volatile context. The paper outlines a number of theoretical and practical implications for context-aware application design and use.

Keywords: Context-Aware Computing, Local Knowledge, Multimethod, Navigation, Situated Knowledge

INTRODUCTION

A central feature of ubiquitous computing applications is their capability to automatically react on context changes as to support users in their mobility (Dey et al., 2001; Henfridsson & Lindgren, 2005). Such context-awareness relies on models of specific use contexts, providing computational resources intended to facilitate user interaction in a given context. More advanced context-aware applications can also dynamically build models of their environment (Lyytinen & Yoo, 2002a). The typical objective of embedding such capabilities into computational artifacts is to support and enhance everyday use of IT over different settings.

Context-aware applications largely depend on their assumptions about user contexts. As highlighted by Dourish (2004), a common context view underlying context-aware applica-
tion design is the representational one, treating context as something fairly stable consisting of a set of informational properties. This context view has proved to be useful in unambiguous contexts. Many of the seminal explorations of context-aware computing such as the Active Badge (Want et al., 1992) embed such a view. However, treating context as a set of informational properties can be constraining in more complex social settings (Chalmers, 2004; Grudin, 2001; Williams & Dourish, 2006). As highlighted by Schmidt et al. (1999), there is more to context than user location and identity. It is therefore not surprising that entire journal issues has been devoted to provide insights about how to build context-aware computing applications and architectures that cater for the typical dynamism of user contexts (see Moran, 1994: Human-Computer Interaction, Moran and Dourish 2001: Human-Computer Interaction, Schmidt et al. 2004: Computer Supported Cooperative Work). Despite the vast debate about context (see e.g., Abowd & Mynatt, 2000; Dey et al., 2001; Greenberg, 2001; Schmidt et al., 1999; Suchman, 2007), however, it has proved difficult to implement comprehensive models of context in wide-spread applications.

An important but sparsely explored aspect of context-aware computing is the role of the user as a co-creator of context. As Dourish (2004, p.22) highlights, “context isn’t just ‘there’, but is actively produced, maintained and enacted in the course of the activity at hand.” This basically means that users’ local and situated knowledge is central to the perception, as well as definition, of a given context. Acquired through previous encounters with similar situations, users’ situated knowledge is therefore part of the use setting, shaping human-computer action (Suchman, 2007). While the relevance of user experience has been highlighted in conceptual articles (Chalmers & Galani, 2004; Dourish, 2004; Greenberg, 2001), there exist few empirical studies that deal with its role in everyday use of context-aware applications.

To address this omission in the literature, this paper outlines a sequential multimethod study (Mingers, 2001) of context-aware application use for better understanding the role of user context co-creation. The study was done in the context of car navigation systems for two reasons. First, car navigation systems are a widely diffused application of context-aware computing. This enables studies of authentic use across situations characterized by different levels of situated knowledge acquired through mundane activity such as commuting. Second, car navigation systems are often highlighted as a typical example of context-aware computing (Abowd & Mynatt, 2000), involving a whole set of context indicators such as position, road classification, traffic information, and driving speed. The paper addresses the following research question: How and why does users’ situated knowledge affect everyday usage of car navigation systems?

The remainder of the paper is structured as follows. Sections two and three outline the theoretical background and rationale for the study. This is followed by a description of the multimethod research methodology employed. Then, we present the findings of the survey and interview study conducted. Thereafter, the theoretical and practical implications of the study are outlined.

RELATED LITERATURE

Context-Aware Computing

Context-aware applications are a type of system that automatically reacts on environmental changes as to support user value (Abowd & Mynatt, 2000; Dey et al., 2001; Dourish, 2004). The key idea is to make information services used over a variety of spatio-temporal contexts more receptive to changing use settings. As Abowd and Mynatt (2000) highlight, such usefulness is typically accomplished by aligning implicit human activity with computing services. Dynamically building models of human activity, well-working context-aware applications can seamlessly and dynamically obtain information about the context in which they are used and adjust their behavior accord-
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