# Chapter 5.8
# Inscribing Interpretive Flexibility of Context Data in Ubiquitous Computing Environments:
## An Action Research Study of Vertical Standard Development

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## ABSTRACT

Ubiquitous computing environments grant organizations a multitude of dynamic context data emanating from embedded and mobile components. Such data may enhance organizations' understanding of the different contexts in which they act. However, extant IS literature indicates that the utility of context data is frequently hampered by a priori interpretations of context embodied within the acquiring technologies themselves. Building on a 5-year canonical action research study within the Swedish transport industry, this paper reports an attempt to shift the locus of interpretation of context data by rearranging an assemblage of embedded, mobile, and stationary technologies. This was done by developing a vertical standard as a means to inscribe interpretive flexibility of context data. With the objective to extend the current understanding of how to enable cross-organizational access to reinterpretable context data, the paper contributes with an analysis of existing design requirements for context-aware ecosystems. This analysis reveals the complexity of accomplishing collaborative linkages between socio-technical elements in ubiquitous computing environments, and highlights important implications for research and practice. *[Article copies are available for purchase from InfoSci-on-Demand.com]*

## INTRODUCTION

Following Weiser's vision (1991), the miniaturization of computing devices and developments in wireless communication technologies have steadily increased. Indeed, the notion of anytime, anywhere computing has for long been evident in the continuous diffusion of embedded and mobile technologies (Lyytinen and Yoo 2002a; March et al. 2000). After some years of progress in application-centered research (Abowd et al. 1997; Abowd et al. 2000; Weiser 1993), ubiquitous computing has now gained ground in the organizational world (Lyytinen and Yoo 2002a; Lyytinen and Yoo 2002b; March et al. 2000; Roussos 2006). Recent IS conferences (Sørensen et al. 2005) and special issues of premier IS journals (Topi 2005; Yoo and Lyytinen 2005) are indicative of the fact that ubiquitous computing has come of age.

Behind the academic debate that surrounds ubiquitous computing is the growing evidence that organizations are increasingly dependent on intelligent environments integrating embedded, mobile, and stationary technologies. With such environments organizations may innovate business propositions and increase customer value because businesses are no longer tied to certain time-constraints and spaces (Fano and Gershman 2002; Jessup and Robey 2002; Yoo and Lyytinen 2005). As ubiquitous technologies appear outside of laboratories, however, organizations need to adapt to increasingly complex computing environments involving embedded, mobile, and stationary elements (Sambamurthy and Zmud 2000). Previous IS research has explored organizational uptake of mobile (e.g., Scheepers et al 2006; Wiredu and Sørensen 2006) as well as embedded technology (e.g. Lee and Shim 2007; Jonsson et al. 2008; Kietzmann 2008). However, there is limited knowledge of how integrated computing environments comprising all of the above mentioned classes of technology are adopted in organizations. A notable exception is Ferneley and Light's (2008) study of a UK Fire Brigade seeking to utilize a variety of advanced technologies.

Context-awareness is an essential notion in research on ubiquitous computing (Dey et al. 2001). It refers to the capability of systems to recognize and adapt to the multifaceted context of their use (Abowd and Mynatt 2000). Recently, seamless computing has been used to denote the vision of fully adapted, integrated, and transparent system support (Henfridsson and Lindgren 2005). To free users from the manual adjustments typically required, an often stated goal is that ubiquitous computing services should dynamically utilize underlying infrastructure resources to operate seamlessly over many contexts (Dey 2001). However, as recognized in the IS literature, there are a number of socio-technical challenges associated with integration of infrastructure resources as to provide a ubiquitous computational solution to a client's requirements (Andersson and Lindgren 2005; Lyytinen and Yoo 2002a).

Studying information infrastructures intended to facilitate efficient and seamless integration of people and systems in transport organizations, Lindgren et al. 2008 show that mobile systems are not simple conversions of stationary systems into a different environment, but require comprehensive integration between embedded, mobile, and stationary components. The study illustrates that captured contextual parameters are subject to interpretation by various individuals or organizations dependant on their use (cf. Dourish 2004). Technology vendors were effectively omitting this important characteristic in attempting to design computing environments delivering their a priori interpretations of context.

At least two lessons learned from the transport industry are also applicable to the general design of ubiquitous computing environments (UCE). First, organizations need to understand and agree on the meaning and value of context data as part of their strategy to integrate embedded, mobile, and stationary technology components. Second, effective UCE must integrate a variety

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