Chapter 2.8
Incorporating Human Factors in the Development of Context–Aware Personalized Applications:
The Next Generation of Intelligent User Interfaces

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ABSTRACT

The notion of context in context-aware applications is not merely an issue of external situational circumstances or device/channel properties, but it could also refer to a wide array of user characteristics that have an effect throughout users' interactions with a system. Human factors such as cognitive traits and current state, from a psychological point of view, are undoubtedly significant

in the shaping of the perceived and objective quality of interactions with a system, and by defining context in that sense, personalization may as well become an essential function of context aware applications. The research that is presented in this chapter focuses on identifying human factors that relate to users' performance in Web applications that involve information processing, and a framework of personalization rules that are expected to increase users' performance is depicted. The environments that empirical results were derived from were both learning and commercial; in the case of E-Learning personalization was beneficial, while the interaction with a commercial site needs to be further investigated due to the implicit character of information processing in the Web.

INTRODUCTION

In the spectrum of all parameters that can be considered as the context of context-aware applications, users' intrinsic characteristics should not be disregarded, especially if information processing is involved. Though it seems that this approach is not the predominant in context aware systems research (Korkea-aho, 2000), human factors are by definition a crucial parameter in the shaping of human computer interaction (HCI)—as suggested by the term itself. According to Dey (2001), "context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves"; Schmidt et al (1999) depict context as a three dimensional construct, including the dimension of self (device state, physiological, cognitive).

In accordance to the aforementioned definitions, our research interests focus on extruding information about the user, which can be proven of significant importance in enhancing the quality of HCI, with emphasis placed upon cognitive

and emotional characteristics. The term cognitive describes systemic functions of the mind that are involved in information perception and processing, whilst emotional parameters refer to the arousal of emotions that affect the learning (as a process) performance, combined with the moderating role of emotional intelligence and skills. The clarification and the weighting of the effect of these human factors could provide new insights to context-aware personalization systems and intelligent user interfaces. In addition, the semantic enhancement of both user profile and services content are expected to increase the effectiveness of eServices, delivered in the best qualitative manner.

This context related semantic information, which actually is the basis of user profiling, provides adequate feedback to an adaptive system that personalizes the Web environment provided to the user according to his preferences or abilities- the context at an intrinsic level that is. This approach and the proposed user model of information processing characteristics also may have a modular role in a context aware system, along with other parameters that compose the broader concept of context.

Moreover, even if such a perspective may seem theoretically viable, we nevertheless consider that its validity may be objectively and empirically measured, in the sense that users are either benefited or not by introducing their intrinsic characteristics as context related information. This empirical validation is the backbone of this chapter, in an effort to elucidate if a certain set of application design guidelines may gradually be developed. Addressing the issue of HCI design, it would be of high practical value to explore new ways of translating theories from the field of social sciences and psychology into apt design rules.

One of the key issues is nevertheless the notion of adaptivity that allows the meaningful use of context related information in the area of individual differences. The function of adaptivity may as well be considered as a level of intelligence

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