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Factors influencing users' employment of mobile map services

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ABSTRACT

This study introduces an integrated research model to examine user acceptance of mobile map services, hypothesizing potential causal connections between key cognitive factors and users' intention to use the services. This study determined potential variables that may be significantly related to perceived usefulness of mobile map services through in-depth interviews with two groups: a user and an expert group. Collected data of 1109 users who took part in the internet survey were analyzed using structural equation modeling. The results indicate that satisfaction with and perceived usefulness of the mobile map services were the most significant antecedents of users' attitude toward the services and behavioral intention to use them. Users' attitude and flow state also affected their intention to use the services, while perceived locational accuracy, service, and display quality had notable effects on attitude. This study demonstrates the significant effects of these and other examined factors, and the findings reveal that *flow* played a multiple moderating roles significantly affecting various connections in the integrated research model. Both theoretical and practical implications are discussed.

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1. Introduction

In ubiquitous environments, mobile map services are one of the most widely and frequently used mobile technologies. Commonly, because mobile map services are used in mobile devices such as smartphones and tablet PCs, they are considered as one of the best geographic information systems (GIS) with the advantages of both GIS and mobile technologies (Park et al., 2012; Weiser, 1991). Because providers present photos and pictures taken from various viewpoints via satellites, automobiles, etc., users of the mobile map services can see anywhere (Oulasvirta et al., 2009).

Mobile devices have become the most pervasive device in the modern world. The global popularity of mobile devices is still growing at a high rate. The International Telecommunication Union (ITU) estimated that there are about 6.8 billion mobile cellular subscriptions (MobiThinking, 2013). With this growth in subscriber base, the number of mobile map services available in mobile devices has been rapidly increased (Park et al., 2012). For example, over 150 million users have activated one of the most well-known mobile map services, Google Map service (Engadget, 2011; Google Inc., 2012). However, despite the wide-spread use of mobile map services, little research has focused on users' acceptance and behaviors regarding mobile map services.

Therefore, the current study aims to investigate users' perceptions of mobile map services by exploring external characteristics of the services based on a well-known model in information systems, the Technology Acceptance Model (TAM; Davis, 1989). This study introduces a new integrated model that can be applied to mobile technologies and geographic information systems to explain user acceptance of the services. Employing the model, this study proposes and validates that two user-related factors, perceived locational accuracy and processing speed, affect mobile map services acceptance. A

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well-known statistical method, structural equation modeling (SEM), is used to test the conceptual relational model of the consequences and determinants of user attitude toward mobile map services. SEM analysis also provides the levels of convergent and discriminant reliability of the proposed model. To test the conceptual relationships of the model, this study considers a user-related aspect of mobile map services usage to highlight mobile user dimensions in exploring and identifying the principal factors affecting the use of mobile map services.

This study has the following research question: What user-related factors can drive their intention to use mobile map services? In addressing this question, this study aims to assess the roles of locational accuracy and processing speed in users' adoption of mobile map services. Park et al. (2012, 2013) indicated that increased accuracy of geographic information systems increases people's intention to use them. In addition, several previous studies found that there are positive relationships between processing speed and users' perceived usability of mobile technologies (Park and del Pobil, 2013).

The present study considers this assertion and highlights specific user factors of mobile map services usage to make the findings of interest to both industrial and academic researchers. The present study can contribute to the development of mobile technologies by providing new understandings of important concepts.

Academically, this study clarifies the key influence of perceived usefulness (PU) on users' attitude and intention to use mobile map services. Although a large number of prior studies have explored a variety of variables that generally lead users to adopt mobile services and geographic information systems, few have tried to identify particular user-related factors. The current study addresses this gap by investigating users' perceptions of locational accuracy and processing speed in mobile map services. It explores new factors and structural connections with other factors. Perceived locational accuracy and processing speed along with perceived service and display quality are employed as new concepts that can reflect particular features of mobile map services in ubiquitous environments.

In addition, recent research effort in this area is expected to provide useful information for industry to improve services evaluation of potential adoptions of mobile services and newly introduced geographic information systems. Many industry practitioners see great business opportunity in mobile applications with geographic information services and are confident that it will develop into a strong market segment in a near-term future. Research is essential to guide the industry toward success. The proposed user-acceptance model seemed to be well-suited for developing a user framework, because mobile devices and applications are one of the most frequently-used items in these days (Shin et al., 2011). In addition, this study suggests that improving the factors in the integrated model that predict successful adoption or failure of new businesses is an important consideration.

The remainder of this paper is organized as follows. First, a literature review and a description of previous studies of mobile map services are provided. Then, the hypotheses and research model are proposed. The research methods used in the current study are explained, and the statistical results are presented. Finally, discussion and conclusions of this study are provided, its limitations are described, and guidelines and directions for future study are presented.

2. Mobile map services

The underlying technologies for mobile map services should incorporate and integrate two or more engineering technologies. The general basic mobile map service architecture is shown in Fig. 1 (Chow, 2008). First, a stable mobile system that

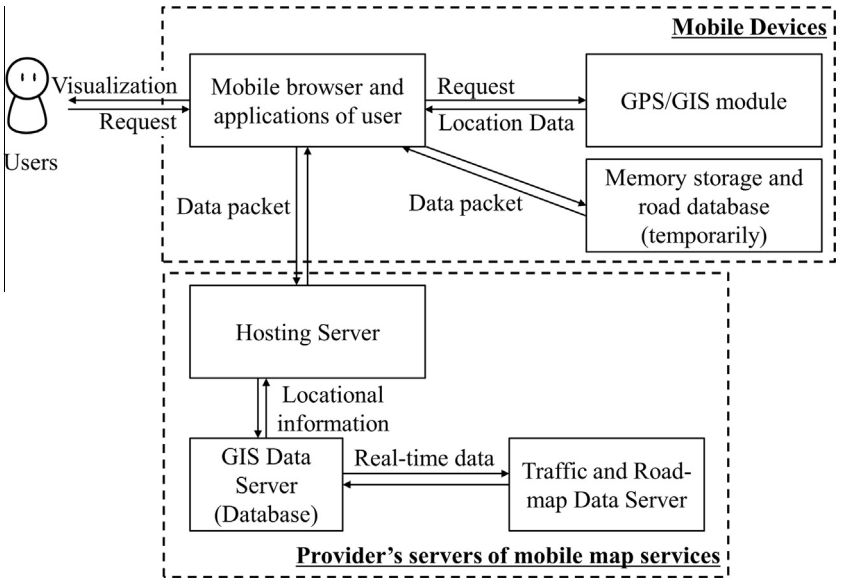

Fig. 1. The general architecture of basic mobile map services.

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