EDITORIAL PREFACE

Mobile and Context-Aware e-Commerce: Issues, Challenges and Research Directions

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Electronic commerce, nowadays, is trying to extend its target audience and elevate the quality of services offered to end-users. Two important directions towards meeting these goals are the embracement of mobile users, whose number grows following the advent of communication technologies, and the inclusion of context-aware features in the delivered services to improve the efficiency of the dialogues between users and systems. The context taken into account may involve characteristics regarding the human user, the geographical location and the time of access, the devices employed to access the service, the network through which the user communicates with the system, the nature of the transaction carried out and so forth.

ISSUES, CHALLENGES AND RESEARCH DIRECTIONS

It is clear that the development and successful operation of mobile and context-aware e-commerce introduce new challenges. In order to tackle such challenges, new methodologies, tools, architectures and platforms should be made available to assist analysts, designers, developers and operators in handling the various phases of the Mobile and Context-Aware E-Commerce Services (MCACS) lifecycle.

Methodologies and Technologies

MCACSs are inherently more complex than "conventional" e-commerce services, since a number of additional aspects have to be taken into account. User-related requirements in this field include the specification of the user profile. Such profiles reflect the preferences and needs of each individual user and/or user group and may include both static and dynamic information (Kules, 2000). User preferences may include interests towards classes of services (Trajkova & Gauch, 2004), service providers, times of the day and/or locations that each service is desirable, device and modality that the service should be offered in (Raz, Juhola, Fernandes, & Galis, 2006) etc. To this end, ontologies appear as the most prominent tool for modelling profiles, since they constitute a semantically rich framework encompassing reasoning capabilities, which are also valuable (Katifori, Poggi,. Scannapieco, Catarci & Ioannidis, 2005). Methodologies for extracting and modelling the user profile in a standardized yet extensible fashion, taking into account individual application requirements constitute a direction pursued by researchers (Golemati, Katifori, Vassilakis, Lepouras & Halatsis, 2007).

System-wise, relevant services have to be discovered, so as to be made available to the users; service descriptions (including capabilities, functional and non-functional service specifications) need to be made available and retrieved to be matched against user profiles and requirements. The UDDI approach for web services description and discovery is inadequate for modelling such aspects, thus extensions incorporating the required elements

have been proposed, such as (Dellarocas & Klein, 2000) (Feier, Roman, Polleres, Domingue, Stollberg, & Fensel, 2005). Services may also need to be composed to fully service user needs; service composition is preferred to be performed in a transparent to the end-user manner, and the most promising approach for fulfilling this requirement is that of a *middleware layer* that will undertake the discovery, composition and orchestration of constituent services to seamlessly deliver the required functionality to the end-user (CoDAMoS, 2003; Kumar, Gopalan & Shridhar, 2005).

The specification and positioning of sensors that will automatically provide context-related parameters and (especially) non-functional parameters of sensors and required underpinnings (such as acquisition and operation cost, physical dimensions and weight), need to be captured by methodologies and possibly correlated with target user groups and the acceptability of these parameter values within each group.

Delivery Architectures and Development Platforms

The special requirements of MCACSs identified in the previous section need to be effectively supported in the service development and service delivery phases as well. MCACSs development platforms must provide the developers with potential to (a) designate which parts need to adapt to context and which not, (b) define adaptation criteria and specify adaptation sensors (c) specify adaptation policy and develop the algorithms that implement it and (d) integrate adaptation and mobility features to the actual services. It is highly desirable that mobility and adaptivity are specified and implemented separately from the actual services' business logic, since mixing these dimensions (according to the laisser-faire adaptation scheme (Satyanarayanan & Ellis, 1996)) results to excessively complex and hard to maintain code. Aspect-oriented programming (Laddad, 2003) can be an efficient tool towards achieving separation of adaptation/mobility implementation and business logic, since the former can be modelled as *cross-cutting concerns* and then be integrated into the business logic using *aspect weavers*.

MCACSs delivery architectures, on the other hand, must provide all necessary infrastructure to support user mobility and provide the required inputs for maintaining an accurate user profile and an up-to-date list of available services. A portion of this information could be provided using globally available services (e.g., the geographic location can be pinpointed by GPS signals) or by the access device employed by the end-user (e.g., current local time), in some cases however the delivery platform must include local stations (Jin & Miyazawa, 2002). Local stations can also assist in minimizing service use costs, since they may provide cheap wireless information access, for instance via WiFi hotspots or Bluetooth access points, as opposed to GPRS connectivity, which is charged by mobile telephony operators. Communication costs for mobile users can also be controlled using handover mechanisms, such as the ones proposed in (Lampropoulos, Kaloxylos, Passas, & Merakos, 2005).

Finally, an important issue that MCACSs delivery architectures should also address, is the timeliness of the delivered services and information; event-based schemata, as the one proposed in (Thawani, Gopalan, Sridhar, & Ramamritham, 2007) can support this requirement.

User Interface Issues

End-user access devices used in the context of mobile and context-aware e-commerce, such as mobile phones or PDAs present significant challenges for user interface and interaction designers, since display space is limited, input controls are more difficult to use (e.g., mobile phone keyboard vs. PC keyboard, lack of mouse), while certain input or output modalities may not be available at all times (for instance, typing an SMS is not acceptable for accessing services while driving a vehicle). To this end, different modalities should be made available to suit the needs of any particular situation, e.g., audible content for output and speech recognition for input; admittedly the latter approach can prove more effective in the case of system-driven dialogues employing controlled vocabularies, rather than arbitrary interactions

with free user type-ins. Different characteristics of end-user access devices and communication environments, such as screen sizes, network bandwidth and available controls need to be taken into account by interface and interaction designers, and each client access device must finally be served with the most appropriate user interface version. Novel user notification and interaction paradigms, such as the customizable user notification cues proposed in (Tarasewich, Bhimdi & Dideles, 2004) should also be considered to improve the machine-user communication effectiveness.

CONCLUSIONS

Mobility and context-awareness are two important directions, which open new potential to e-commerce, but introduce a number of issues and challenges that need to be addressed fully deliver their promises to end-users. Research efforts have already delivered a number of proposals for tackling individual topics, but a number of issues still remain open and standardization activities need to proceed fast, to enable organizations to proceed to investments without high risks of purchasing systems that will soon be obsolete due to market direction changes. Social issues, such as trust development towards services, information technology literacy and technology penetration for distinct user and social groups need to be studied and taken into account, since technology itself has proven not to be a sufficient guarantee for the success of e-commerce initiatives.

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GUEST EDITOR BRIEF BIOGRAPHICAL NOTES

Dr Costas Vassilakis received a B.Sc. in Informatics (1990) from the Department of Informatics, University of Athens and a Ph.D. from the same department (1995). Dr. Costas Vassilakis has participated in several European and national projects and has published more than 60 scientific papers in international journals and conferences. He has been a consultant for the General Secretariat for Information Systems of the Ministry of Finance, Greece. He is currently an assistant professor in the department of Computer Science and Technology, University of Peloponnese, Greece.

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