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Business models and transactions in mobile electronic commerce: requirements and properties

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Abstract

Advances in wireless network technology and the continuously increasing number of users of hand-held terminals make the latter a possible channel for offering personalized services to mobile users and give pace to the rapid development of mobile electronic commerce (MEC). MEC operates partially in a different environment than Internet e-commerce due to the special characteristics and constraints of mobile terminals and wireless networks and the context, situations and circumstances in which people use their hand-held terminals. In this paper, we discuss the business models in MEC and transaction modeling issues pertinent for the business models and the environment. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Mobile computing; Electronic commerce; Business models; E-commerce transactions

1. Introduction

Advances in wireless network technology and the continuously increasing number of users of hand-held terminals make the latter a new channel for offering personalized services to mobile users and give pace to the rapid development of e-commerce conducted with portable devices. The basic requirement for mobile e-commerce and personalized services is that the mobile wireless devices are either directly ''Web-enabled'' or at least ''WAP-enabled'' [11] or ''I-mode-enabled'', i.e., ''Internet-enabled''. Current estimates of the number of such wireless Internet-enabled devices range from 134 to 330 millions around the year 2003 [3].

Mobile electronic commerce (MEC) or mobile e-business refers to e-commerce (e-business) activities relying solely or partially on mobile e-commerce transactions. As a mobile e-commerce transaction we define any type of transaction of an economic value that is conducted through a mobile terminal that uses a wireless telecommunications network for communication with the e-commerce infrastructure. MEC operates partially in a different environment than e-commerce conducted in fixed Internet, due to the special characteristics and constraints of mobile terminals and wireless networks and the context, situations and circumstances in which people use their hand-held terminals. MEC has a number of business, technical and legal implications that are different from e-commerce in the fixed Internet setting. Most notably, location-based products and services is a completely new business, technical, and legal area that is typical only of MEC. MEC

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becomes interesting with the huge proliferation of the WWW-based business-to-consumer (b-to-c) e-commerce in Internet since 1995 and the simultaneous and huge proliferation of digital wireless telecom networks throughout the world.

In this paper, we first present the special characteristics that differentiate MEC transactions from traditional e-commerce transactions, in particular the constraints of mobile terminals and wireless networks and the context, situations and circumstances in which people use their hand-held terminals. Then, we focus on how these characteristics affect MEC business models and the important role that mobile network operators (MNOs) can play in this context. We also present a formal model for MEC transactions and their properties.

The remainder of this paper is structured as follows. In Section 2, we survey some of the issues that differentiate MEC from traditional electronic commerce. In Section 3, we present the business models and the main players in MEC. In Section 4, we focus on MEC transactions, their properties and how they relate to business models. Section 5 concludes the paper.

2. Peculiarities of the wireless environment

2.1. Implications of the mobile terminals

Mobile devices that are of interest to MEC can be divided into four categories based on their processor, memory and battery capacity, application capabilities (SMS, WAP, Web, I-mode), as well as physical size and weight. These categories are (from weakest to strongest): usual voice handsets with SMS capability, WAP phones, communicators/PDA with wireless communication capability (e.g. [5]), and finally laptops with wireless communication facilities. To be easily carried around, mobile devices must be physically light and small. The smaller and lighter the devices are, the *more portable* they are. In addition, a mobile device should be a multipurpose device (voice phone, data transmitter, PDA, etc.) so that the user does not need to carry too many gadgets. Portability considerations, in conjunction with a given cost and level of technology, will keep mobile elements having less resources than static elements. In particular:

- The devices have small screens and small, multifunction keypads; the former fact necessitates the development of appropriate visual user interfaces, different from the PC or laptop.
- They have less resources than static elements, including memory, disk capacity (usually absent from the three lower classes) and computational power than traditional computing devices.
- Portable devices rely for their operation on the finite energy provided by batteries. Even with advances in battery technology, this energy concern will not cease to exist. This is because the conserved energy depends primarily on the weight volume of the battery. Different technologies have in this respect different coefficients, but the law is the same.
- There are higher risks to data stored and transactions performed in mobile devices, since it is easier for mobile devices to be accidentally damaged, stolen, or lost than fixed devices.

2.2. Implications of the wireless networks

The necessary networking infrastructure for wireless mobile computing in general combines various wireless networks including cellular, wireless LAN, private and public radio, satellite services, and paging [10]. As compared with wireline networks, wireless communications add new challenges:

- *C-autonomy*. The handsets in the wireless radio networks are normally not always communicating with the network infrastructure, i.e., they are unreachable. There are numerous reasons for this behavior that can be described under C(ommunication)-autonomy [8]. First, disconnections may be voluntary, e.g., when the user deliberately avoids network access during nighttime, or while in a meeting, or in other places where the user does not want to be disturbed. In cases that the handset does not have voice capabilities, and thus disturbing is not a big issue, it is still often reasonable to cut the wireless communications with the network to reduce cost, power consumption, or bandwidth use. The break in on-going communi-