



Ubiquitous Commerce: Ubiquitous Computing Based Commerce

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Abstract- *With the rapid advancement in field of networking and communications, no aspect of human life is untouched. Commercial activities are also affected by the new advancements. Traditional commercial activities are changed and modified with the passage of time. Firstly, the age of E-Commerce arrived, then M-Commerce. Now, after E-Commerce and M-Commerce, the age of Ultimate Commerce is arrived. Any time/ Always/ Anywhere service providing is the key to this ultimate or ubiquitous commerce. This paper studies the concept of ubiquitous computing and its adaption to commerce with new issues associated.*

Keywords- *Ubiquitous computing, Ubiquitous commerce.*

I. INTRODUCTION

Ubiquitous commerce, also referred to as 'u-commerce' is a new paradigm that broadens and extends the Internet usage in today's environment. With the rapid development of ubiquitous computing and mobile communication technologies, the traditional business model is changing drastically. As a logical extension of e-commerce and m-commerce, Watson proposed the concept of ubiquitous commerce (u-commerce) in 2000. As the next generation business model, it immediately gained a lot of attention. U-commerce emerges as a continuous, seamless stream of communication, content and services exchanged among businesses, suppliers, employees, customers, and products. It will enable interactions and transactions to happen anywhere and at any time without being constrained to stay connected through power and telephone lines. Through the convergence of the physical and digital means, u-commerce can create higher levels of convenience and added value. Hence, u-commerce can be defined as: "The use of ubiquitous networks to support personalized and uninterrupted communications and transactions between a firm and its various stakeholders to provide a level of value, above and beyond traditional commerce" [1].

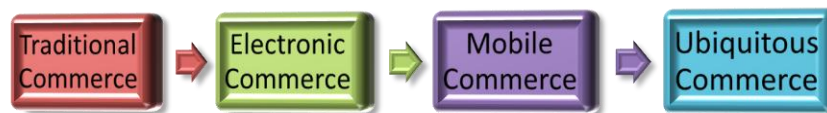


Figure 1 : Changes in commerce over the time

U-commerce can be viewed as a logical extension of e-commerce and m-commerce. It represents the next phase of commerce, which is opened by e-commerce and raised by m-commerce. U-commerce is going to be the next wave in commerce – i.e., after e- and m-commerce (Watson, 2000). Thus, Ubiquitous commerce or u-commerce is the combination of traditional e-commerce and wireless, voice and silent commerce. It is not a replacement for other types of commerce, but an extension of them. Based on a literature review and the interview results from practitioners in the field, Watson identified four fundamental characteristics of u-commerce – ubiquity, universality, uniqueness, and unison. And called them the u-constructs[3].

Ubiquity = Reachability + Accessibility + Portability

Universality = Mobile networks + Mobile devices

Uniqueness= Localization + Identification + Portability

Unison = Mobile applications + Data synchronization

The rest of the paper is organized as follows: Section 2 presents a comprehensive discussion on the ubiquitous computing. Section 3 highlights the components of ubiquitous commerce. Section 4 discusses the security and privacy issues in u-commerce and the last section suggests future research in this area.

II. UBIQUITOUS COMPUTING

Ubiquitous computing is viewed less as a discrete field of technology, but rather as an emerging application of information and communications technology that is integrated into the everyday world more than ever before. The goal is to meet the claim of "everything, always, everywhere" for data processing and transmission through the ubiquity of ICT systems [4]. Ubiquitous computing is thus a complementary paradigm to virtual reality. Rather than reproduce and simulate the world with a computer, ubiquitous computing turns all objects in the real world into part of an information and communications system. Ubiquitous computing is definitely changing the ways in which we use computers. In

ubiquitous computing, a variety of processes run automatically in the background and interacts on behalf of the user. The user does not have to provide explicit instructions or make decisions. Ubiquitous computing involves smart environments that are foreseen as an individual's cooperative partner. However, the seeming disappearance of the computer together with the delegation of complex processes or tasks to a ubiquitous ICT infrastructure raises serious questions [4]. The anytime/ any place principle of ubiquitous computing emergence as the natural result of research and technological advances in wireless and sensor networks, embedded systems, mobile computing, distributed computing, agent technologies, autonomic computing and communication. Ubiquitous computing paradigm integrates computation into the environment [5].

1.1 Features of Ubiquitous Computing:

Some of the remarkable features of ubiquitous computing are as follows.

- **Embeddedness:** Small intelligent devices are embedded in the physical world and connected to the fixed and/or wireless network.
- **Mobility:** client devices must be operated under the mobile and flexible network infrastructure.
- **Nomadicity:** the system provides a rich set of computing and communication capabilities and services to nomads as they move from place to place in a way that is transparent, integrated, convenient, and adaptive.
- **Proactiveness:** the system needs to be self-triggered to capture a priori what its users want to increase the service quality.
- **Invisibility:** to be as unobtrusive as possible, enable the user to put as little data as possible.
- **Portability:** providing services with hands-free or at least one-handed light devices [6].

Since the adaptive capability of these systems, the ubiquitous computing concept can be successfully introduced in several fields such as learning, cultural heritage and tourism, by becoming a new tool for promotion, retailing, by predicting the u-commerce as an innovation able to make traditional e-commerce obsolete and to force firms to develop new capabilities for fast responding to the market trend [7]. In the u-commerce environment, computing devices can be embedded in ordinary objects to make them intelligent and interactive. U-commerce is grounded in the four u-constructs – ubiquity, uniqueness, universality, and unison – u-commerce describes a new computing environment (also termed ubiquitous computing environment) ubiquitous computing environment, applications will become independent of the underlying network, data, or the device used [8].

III. COMPONENTS OF UBIQUITOUS COMMERCE

U-commerce (ubiquitous) is defined as combination of e-commerce and m-commerce, e-commerce using interactive digital television (iDTV) as communication media, voice commerce and silent commerce. Each u-commerce element uses positive characteristics of other elements and modifies it according to newer and sophisticated customer needs. We can view u-commerce as a conceptual extension of e-commerce and m-commerce.

3.1 Mobile commerce

M-commerce is sometimes referred to as “mobile e-commerce”, because its transactions are basically electronic transactions, conducted using a mobile terminal and a wireless network.

3.2 Electronic commerce

With the development of global information technology and Internet based Web services, a new business model electronic commerce is coming up. A simple definition of e-commerce describes it as “the buying and selling of products and services over the Web”. There are three main types of e-commerce: business-to-consumer(B2C), business-to-business(B2B), and consumer-to-consumer(C2C). In addition, government-to-government(G2G), government-to-consumer(G2C), and consumer-to-government(C2G) has emerged. E-commerce is the most established type of commerce performed through digital means.

3.3 Wireless commerce

Wireless commerce extends e-commerce with characteristics such as reachability, accessibility, localization, identification, and portability. Wireless commerce is a key part of u-commerce, because it creates the possibility for communications between people, businesses, and objects to happen anywhere and anytime. Wireless commerce use mobile and wireless devices for both communication and business transactions.

3.4 Voice commerce

V-commerce is a commerce based on listening and speaking. An increasing number of businesses are using computerized voice technologies: speech recognition, voice identification, and text-to-speech. Voice commerce enables businesses to reduce call-center operating costs and improve customer service. Voice commerce can also be used to generate new sources of revenue, but this will probably take longer to materialize.

3.5 Television commerce

Television Commerce is a commerce model, which provides a new audio visual away and the diversity of choice by broadcasting the products information in the 24hour nonstop television shopping channels.

3.6 Silent commerce

Silent commerce uses advanced tagging and sensor technologies, as well as wireless mobile communications, to make everyday objects intelligent and interactive, creating new information and value streams. It is “silent” in that objects can communicate and commerce can take place without human interaction [2].

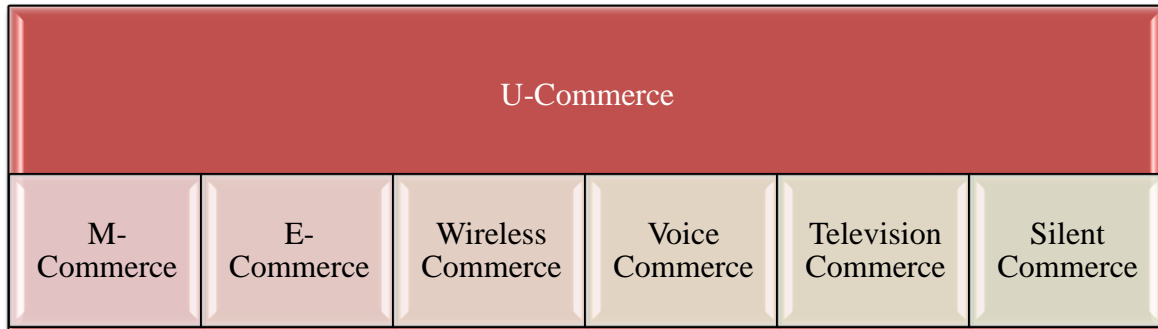


Figure 2 : Ubiquitous Commerce

IV. SECURITY AND PRIVACY ISSUES IN UBIQUITOUS COMMERCE

Consumers’ concerns in the u-commerce application mainly from two aspects: (1) fear that they will continue to be tracked; (2) worried that their private information will be spreaded and illegal used [1]. Therefore, security and privacy concerns arise and demand extra attention for the organization to be adopting u-commerce.

4.1 Security

In the ubiquitous commerce environment, since services are provided via any device anywhere at any time, it is more exposed to security breaches compared with the physically secured and controlled environments [10].

4.1.1 Authentication. This is a process by which one entity verifies the identity of another which can be person or program. The authentication process can be done in three ways: something that a user knows such as password and login name, something that a user has such as a Personal Identification Number (PIN) and something that is naturally unique to a user such as finger print, voice or face[11].

4.1.2 Authorization. This is the process that ensures that a person has the right to access certain resources. A user will not be allowed to access any resources without knowing the attributes of such user. Users can have access rights to resources if the authority to do something is not within their reach[11].

4.2 Privacy

It is defined as “the moral right of individuals to be left alone, free from surveillance or interference from other individuals or organizations, including the state”. There are several reasons for privacy protection:

- 1) Privacy empowers people to control information about themselves;
- 2) Privacy is the right to be left alone;
- 3) Privacy is related to dignity in the reciprocal obligations of disclosure between parties; and
- 4) Privacy can be used as an agent to regulate and control information collection and use.

Privacy concerns are considerably higher in u-commerce than in other types of commerce (e.g., e-commerce or m-commerce) for the following reasons: 1) advancements in ubiquitous technologies (such as sensor networks and location awareness technologies) have increased the amount of customers’ personal data that is available; 2) the introduction of perceptual and biometric interfaces of certain u-commerce applications allows third parties to identify users; and 3) u-commerce will require the tracking or collection of users’ everyday activities in order to provide personalized services [8].

4.2.1 Impact on privacy

A ubiquitous computing design for privacy that conforms to data protection standards is regarded as a requirement for ensuring privacy. In the use and processing of data, rendering all steps in the process visible and logically comprehensible seems to be of less importance. Far more crucial is a user’s explicit trust in a particular ubiquitous computing system that the service provider will handle personal data responsibly. Apart from this concern, there is the danger that frequent use of a ubiquitous computing application could potentially lead to the inattentive handling of personal data [4].

V. FURTHER RESEARCH IN U-COMMERCE

U-commerce has attracted considerable attention in the industry and has shown significant potential for future applications. In future more attention should be given to u-commerce economics, strategies, and business models. In u-commerce, business model is a very important research issue. Data synchronization technology is another issue. In u-commerce, mobile devices with powerful computing capacity come out one after another, and how to ensure the

consistency of the data in these devices using the data synchronization technology has become a crucial issue. By a data change in one application on one particular device automatically transmitting to all other associated applications and devices, unison allows data to be integrated across different applications so that people can have a consistent view of information [9]. Future development in data integration will support a cross-network, cross-device, cross-application and even cross-group functionality. Groups and project teams need synchronization so that the latest versions of their various electronic documents should always be available. Future research should pay more attention to the ubiquitous communication protocol. Since u-commerce involves/refers to various technological means (e.g. sensors, localization, RFID, etc.), its development and construction will be a massive systematic project. With different and complicated components working together, it is undoubted that the middleware, which enables the interoperability of distributed architectures and simplifies complex and distributed applications, will play a very important role. As a result, drawing up related standards and protocols namely establishing the suitable middleware is the basic work to coordinate all the technologies [9].

VI. CONCLUSION

Ubiquitous commerce is no longer a vision, but over the past few years it is gradually becoming a reality. This can be mainly attributed to the recent technological advances, which made the deployment of pilot initiatives technically and economically possible. The evolution of e-commerce into m-commerce had led us to a world of ubiquitous commerce (u-commerce). U-commerce is facilitated by the emergence of four U-forces; ubiquity, universality, uniqueness and unity. This paper has explored the issues surrounding adaptation of Ubiquitous computing into commerce to make u-commerce systems. However, a great effort is still required to adopt the latest advancements in the field of commerce.

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