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Abstract

This article elaborates and extends several new concepts that lay the foundation for thinking about next-generation commerce—so-called ultimate commerce, or simply u-commerce. U-commerce extends traditional commerce to a world of ubiquitous networks and universal devices, a world in which users can access networks at any time from any place, using a range of devices to invoke unique and personalized services. Specifically, four constructs are discussed that form the fundamental dimensions of u-commerce: ubiquity, uniqueness, universality, and unison. It is proposed that future developments of information systems will be framed by these constructs.

Keywords: U-commerce, m-commerce, e-commerce, ubiquity, uniqueness, universality, unison

Introduction

The Internet has introduced a significant wave of change. Our communication patterns have changed. We have become dependent on e-mail. We interact with firms via Web sites. The next wave—introduced through wireless technology—is about to change our lives even more. The increase in transmission capacity of wireless devices lays the foundation for communication unrestricted by physical location. We can surf the Internet decoupled from landline computers. In addition, we can do it any time, blurring the borderlines of business and private space (Agre 2001). In the near future, we will experience another wave of change—a world that provides the ultimate form of ubiquitous networks and universal devices, a world that presents an alternative view of space and time (Miller 2002; Watson *et al.* 2002) and, thus, should be called the ultimate commerce, or simply u-commerce. U-commerce represents a state of commerce that we have not reached yet and that is rather visionary in nature at present. It represents a form of commerce that goes over, above, and beyond traditional commerce. Accordingly, u-commerce is 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 over, above, and beyond traditional commerce" (Watson *et al.* 2002).

A glimpse of the potential of u-commerce can be seen in today. For instance, in Texas, people are able to pay for gas with their mobile phones at the pump. Soon, they will also be able to pay for parking, fast food, etc. (Wireless Newsfactor 2002). IBM has launched smart laundry machines at colleges. Students can visit a Web site to find out when a machine will be available and can select functions, including soap and fabric softener dispensing. When the load is done, they are notified via e-mail sent to a mobile device or PC (Wrolstad 2002a). MommyTrack is a baby monitor that allows remote viewing from a PDA (personal digital assistant) device running Microsoft's PocketPC Phone Edition (Bresien 2003). Cenuco also is working with Nokia and Symbian-powered smartphones in order to enlarge the spectrum of handheld devices that can use the system (Wrolstad 2002b). Samsung Electronics introduced their first GPRS[1] wristwatch phone at the CeBIT 2003. The GPRS watch phone offers one and a half hours of continuous talk time and 80 hours of stand-by time at the flick of a wrist (Samsung 2003). Prior to this, Samsung had already

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[1]General packet radio switched, 2.5 G technology. For more information, see Junglas and Lehner (2001).

issued the smallest cell phone TV in 2000—for which Samsung is listed in the Guinness Book of World Records. The cell phone TV presents a combination of TV and cellular phone that offers 200 minutes of TV viewing and 170 minutes of cellular phone talk time (Samsung 2003).

Electronic Commerce → **Mobile Commerce** → **Ultimate Commerce**

Figure 1. X-Commerce Evolution with x = e, m, and u

The phenomenon of u-commerce is not new. The idea has been prevalent since the time people were branching off to new forms of commerce, such as e- and m-commerce. U-commerce can be viewed as the conceptual extension of e- and m-commerce. However, its purpose is not to serve as a substitute for either of them; rather different forms of commerce will coexist. U-commerce simply represents the final (and still emerging) destination of commerce—initiated by e-commerce and propagated by m-commerce. Its purpose is to lay the groundwork for structuring future information systems and providing a discussion forum for trends in the field of IS. In the past, IS research has often been criticized for being outdated and not relevant to industry (Lyytinen and Yoo 2003). This paper, in contrast, takes the challenge tackling an ill-defined future and pointing out cornerstones that we have to pass on our way to the next generation of commerce.

In order to describe the cornerstones of u-commerce (or so-called u-constructs), we will examine transitions that take place between the different stages of commerce. First we will scrutinize the transition between e-commerce and m-commerce. We will then study the transition between m-commerce and u-commerce (Figure 1). By doing so, we will be able to carve out characteristics that are inherent to each stage of commerce. In particular, we will be able to extrapolate characteristics that form the crux of our findings on u-commerce.

From E-Commerce to M-Commerce: What Is Different?

Compared to e-commerce, m-commerce has some features that make it distinct. Based on current literature, these characteristics comprise five clusters, including reachability (Skiba et al. 2000), accessibility (Buckler and Buxel 2000; Müller-Verse 1999), localization (Buckler and Bruxel 2000; Müller-Verse 1999; Skiba et al. 2000), identification,[2] and portability.[3] Figure 2 provides a graphical overview. In order to linguistically distinguish between the same characteristics in the electronic and the mobile commerce world, the prefixes "e-" and "m-" are used, respectively.

Electronic Commerce → **Mobile Commerce**

Portability
and

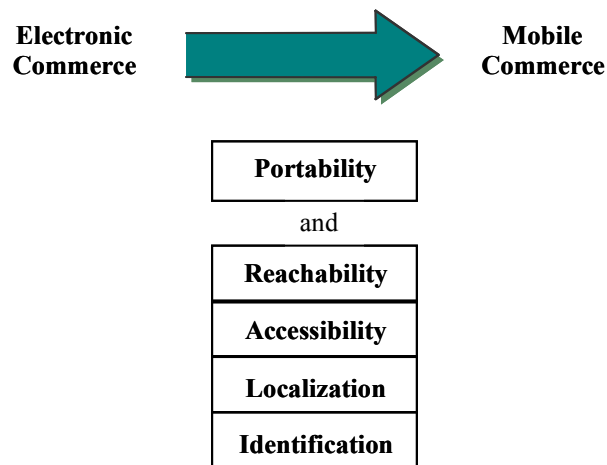| **Reachability** |
| :---: |
| **Accessibility** |
| **Localization** |
| **Identification** |

Figure 2. The E- to M-Commerce Transition

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[2]Müller-Verse (1999) refers to this as *security*.

[3]Skiba et al. (2000) refer to this as *form factors*.

Portability

Portability comprises the physical aspects of mobile devices—one is able to readily carry them. We deliberately use the term *mobile device* to cover the aspect that extends beyond cellular phones which form only one end of the spectrum, providing a small, lightweight device for voice (and data) communication. The other end is formed by laptops equipped with a wireless communication facility, providing multipurpose capabilities at the cost of a bigger device. Along that spectrum, smart phones, communicators, personal digital assistants (PDA), etc. line up accordingly. The list is just a momentary snap-shot of the current products available. One can expect the range and the form of mobile devices to proliferate. Nevertheless, all mobile devices have and will have in common the striving for miniaturization while maximizing their capabilities.

Among the five characteristics, portability has a unique standing. In fact, it enables the other four constructs to be unique and distinct from the traditional e-commerce setting, i.e., reachability, accessibility, localization, and identity are inherent characteristics of the mobile world if—and only if—they occur in the context of portability. As such, portability is the underlying characteristic that causes a quantum shift within each.

Reachability

M-reachability covers the idea that a person can be in touch and reached by other people 24 a day hours, 7 days a week—assuming that the mobile network coverage is sufficient and the mobile device is switched on. Nevertheless, users have the possibility to restrict their m-reachability to particular persons or times. With the current transmission technologies (i.e., GSM—global system mobile), mobile devices require a user to actively initiate a session and invoke an application—just like an Internet session. With future mobile technologies, however, users will stay connected permanently—without explicitly establishing a connection.[4]

In an e-commerce setting, e-reachability is limited to the computer level, or rather the plug-in level. An Internet user is reachable only (in synchronous terms) when sitting in front of a computer that is plugged into an Internet socket.

Accessibility

Opposed to m-reachability, m-accessibility describes the fact that a user can access the mobile network at any time from any location—again, assuming adequate mobile network coverage. With current transmission technologies, a user has to proactively initiate a session. Future mobile technologies, however, will allow users to stay connected permanently.

In contrast, e-accessibility (just like e-reachability) is limited to the plug-in level. A user can access the Internet only when sitting in front of a hardwired computer.

Localization

M-localization describes the ability to locate the position of a mobile user. As such, m-localization is key to providing geographically specific value-added services (so-called location-based services) and is expected to be the most distinct characteristic of m-commerce compared to e-commerce. Location-based services are defined as any kind of services that take into account the geographic position of an individual. These services may include geographic information about the individual (e.g., for navigational purposes) or location information about others (e.g., for finder services that let mobile users locate friends or family, businesses, or landmarks). Currently, mobile networks are already able to determine the physical position of a mobile user on cell level. From a technological point of view, this is to ensure a reliable connection when a mobile user roams across cell boundaries. Future technology, however, will make it possible to determine the exact geographical latitude and longitude of a mobile user.[5] The Federal Communications Commission, for instance, has issued an E911 (Enhanced 911) mandate stipulating that wireless 911 callers have to be automatically located within seconds. By 2005, all devices are requested to obey the E911 mandate (FCC 2003).

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[4]Müller-Verse (1999) calls it *instant connectivity* and states it to be an m-commerce characteristic on its own.

[5]A more detailed description of the underlying technologies can be found in Junglas and Lehner (2001).

In the Internet context, the geographical position of a user cannot be determined at any point during the session. The only possibility is to identify a computer's physical IP (Internet Protocol) address and, based on that, its physical location. However, even this approach is not always applicable since most networks use a dynamic addressing scheme.

Identification

Second generation mobile devices employ a smart card as a secure device for the authentication of the subscription and the mobile user. The smart card, also called a SIM card (subscriber identity module), contains subscription and security related data as well as user data, and is plugged into the mobile device.[6] By doing so, it decouples the identity of the mobile user from the device, thus allowing a user to switch physical devices without changing identities. The SIM card can be viewed as a virtual substitute of an individual's identity, containing not only personal information, but also billing information.[7] We therefore label this construct m-identity.

In contrast, in the Internet context, the identity of a user is always bound to the computer, i.e., it is device-dependent (versus device-independent). Two approaches of e-identification are conceivable: (1) application level and (2) hardware level. On the application level, Internet applications can store limited information about a user's identity using cookies. However, due to the technical nature of HTTP (hypertext transfer protocol), one cannot gather a consistent and comprehensive profile using these. In addition, actions such as users switching computers, or users deliberately providing false information, exacerbate the problem. One user may have multiple profiles for a single application. In this case, a unique identification from an application's point of view (or rather from a company's point of view) is not possible. On the hardware level, the IP address of the networked computer may reveal identity information. However (and as mentioned before), dynamic IP addressing schemes may impair or even thwart this approach.

From M-Commerce to U-Commerce: What Is Going to Happen?

In order to study the transition from m-commerce to u-commerce, we take a rather unusual approach for the IS field. Since major differences between m-commerce and u-commerce will mostly appear on the technological level, it makes sense to take an approach that has proven to be beneficial in the telecommunications field. Here, the OSI model (open systems interconnection) has served as a reference model for communication protocols. The core idea of OSI is that the process of communication between two end points in a network can be divided into different conceptual layers, with each layer executing its own set of functionalities and relying on services provided by the underlaying layers. The bottom layer, for instance, is responsible for a reliable data transmission, whereas the layer at the top is responsible for displaying transmitted data using the appropriate application.

For the purpose of this paper, we have adapted the OSI idea and structured our approach of examining the transition between m-commerce and u-commerce accordingly. Our perspectives taken are (1) mobile applications, (2) mobile networks, (3) mobile devices, and (4) data integration. The different levels of abstractions will help to reflect on dimensions that contribute to (or impair) the degree to which m-commerce can finally lead to u-commerce. Currently, most of these dimensions appear to be limitations; with time, however, these are expected to vanish, i.e., mobile applications, networks, and devices are forecast to merge, and data are predicted to be fully synchronized.

Mobile Applications

Typically, mobile users manage to learn their mobile device's functionalities very fast—contrary to using a PC for the first time. This is partly because current mobile devices are limited in their range of applications. For instance, cell phones are mainly used for placing calls; PDAs are mainly used for personal data management. Their limitation to specific applications is mainly due to technological reasons. With merging networks, devices, and data, however, we expect mobile applications to span a broader range of functionality and be universally usable, independent of the underlying network, data, or the device used.

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[6]A more detailed description of the underlying technologies can be found in Junglas and Lehner (2001).

[7]Network operators and providers have to authenticate a user and test financial status before the user can become a mobile subscriber. As a result, the personal information provided is close to 100 percent accurate.
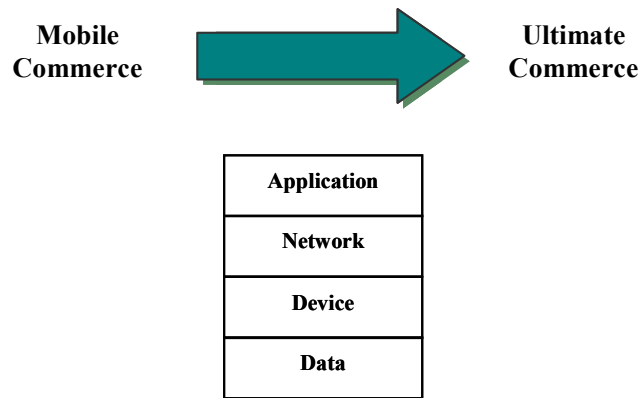
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Mobile                                    Ultimate
Commerce         ━━━━━━━━▶              Commerce
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Application
Network
Device
Data

Figure 3. The M-Commerce to U-Commerce Transition

Mobile Networks

We experience a heterogeneous landscape of mobile networks. Ranging from analog systems at one end to digital systems of different generations (such as second generation, third generation, etc.) on the other. Even though the latter underwent a thorough standardization process, there are variations that typically differ in terms of technical protocols and frequencies used. As a result, for example, a U.S. cell phone is unlikely to work in Europe because of different network frequencies. In the future, however, and as can be seen by various standardization movements, we expect mobile networks to be universally usable across multiple platforms and across all countries.

Mobile Devices

Users can pick from a broad range of electronic tools to perform a certain task. This varies from cell phones to PDAs, to laptops. With time, we expect more and more traditionally separated applications to be integrated into one mobile device. As already can be seen by smart phones (a hybrid between the cellular phone and the PDA), this trend is on its way. It will be propagated by combining cellular devices with traditionally non-IS devices such as jewelry or even clothes.

Data Synchronization

Ideally, mobile devices provide integrated and synchronized data. For instance, the phonebook stored on a cellular phone not only matches all other electronic phonebooks stored on other (wired as well as wireless) devices, but it also matches personal calendars, to-do lists, etc. A data change in one application on one particular device is automatically transmitted to all other associated applications and devices. Currently, however, due to heterogeneous networking standards, incompatible applications, and devices, we still experience some limitations. Nevertheless, future development in data integration will support a cross-network, cross-device, cross-application and even cross-team functionality.

The Building Blocks of U-Commerce

Up to this point, we have examined the different stages of commerce and their characteristics. It is now time to pull all these characteristics together and carve out the fundaments of u-commerce (also called u-constructs) and extend the earlier work on these concepts (Watson 2000; Watson *et al.* 2002). Four higher-level constructs are identified. They comprise ubiquity, uniqueness, universality, and unison and can be described as follows.

>   *Ubiquity = Ultimate form of (Reachability + Accessibility + Portability)*

Uniqueness = Ultimate form of (Localization + Identification + Portability)
Universality = Ultimate merge of (Mobile Networks + Mobile Devices)
Unison = Ultimate merge of (Mobile Applications + Data Synchronization)

Ubiquity

Ubiquity incorporates the idea of accessibility, reachability, and portability into one construct: people are able to access networks at any time from anywhere and, in turn, are reachable at any time and any place. While reachability and accessibility provide the aspect of any time availability, portability takes care of the any place component—thus, introducing a *truly* any place level into our traditional thinking (Figure 4). Group support systems and computer-supported cooperative work research have introduced a two-by-two matrix with its dimensions of time and place, each distinguishing between *same* and *different*. Interestingly, even though termed *different*, the model assumed that places are *dedicated*. In a ubiquitous world, however, information systems are not restricted in their usage to dedicated places anymore but can be used literally everywhere: in cafes, trains, at airports, etc. As a result, we have to add another dimension—a *truly* any time and any place dimension (see Figure 4)—taking into account the portability aspect of future devices (Wiberg and Ljungberg 1999).

The mobile phone is a good example of early ubiquity. In the early stages of mobile penetration, a lot of subscribers bought a mobile phone mainly for emergency calls. Even if intended for that purpose only, people quickly started using it for calling family and friends on the run. Interestingly, the worldwide penetration rate of mobile phones has been steadily increasing every year. Since 1996, worldwide mobile phone penetration has grown approximately 42 percent on an annual basis, surpassing 1 billion mobile subscribers in the second quarter of 2002 (EMC 2002). That means mobile phones are accessible to people beyond the reach of today's Internet since they do not require complex and costly PCs. They bring many of the benefits of the Internet to a far wider population. Ultimately, we envision a world that provides the fullest level of ubiquity, i.e., omnipresent wireless availability combined with high transmission rates—irrespective of the device used.
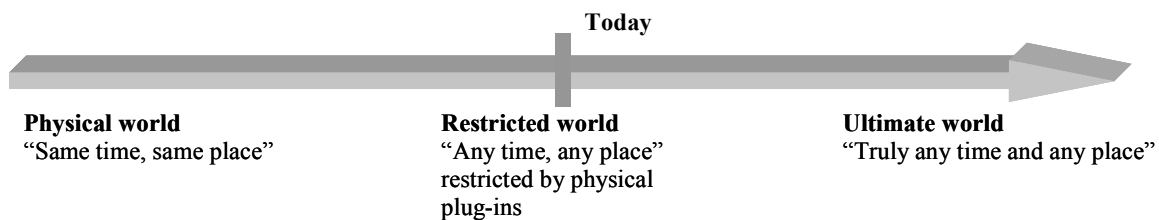
Today

Physical world	Restricted world	Ultimate world
"Same time, same place"	"Any time, any place" restricted by physical plug-ins	"Truly any time and any place"

Figure 4. Ubiquity Continuum

Please note that some authors capture the idea of ubiquity under a different label, namely mobility (Kakihara and Sørensen 2002a). Conceptually both are identical; whereas ubiquity takes on the lens of the environment to provide the functionality for a user to move, mobility takes on the lens of a user being the active component in a ubiquitous environment.

Uniqueness

Uniqueness covers the idea of a user to be uniquely identified—not only in terms of identity and associated preferences, but also in terms of geographical position. As such, uniqueness incorporates the idea of identification, localization, and portability into a higher-level construct. Whereas identification provides an unequivocal person assignment, localization provides the geographical position component. Here again, mobile phones are a good example of uniqueness in its early stages. Nowadays, it is expected that if somebody tries to call a person on a cellular phone, nobody other than the cellular phone owner picks up the phone (versus calling this person's home phone number where potentially any household member could pick up). Combining the fact of knowing who the person is with location-based services will lead to the ultimate level of uniqueness: we not only know who this person is but also where that person is. As such, ultimately we envision a world in which *true* unequivocality is conceivable and *true* one-to-one marketing becomes reality (Figure 5). Consumers will benefit from the fact that their individual profile is stored exactly once, that they can carry it with them (in the form of a SIM card, for instance), and that it is under their control to propagate this profile to businesses only upon request; businesses will benefit from being able to target their efforts to a person's preferences and locations.
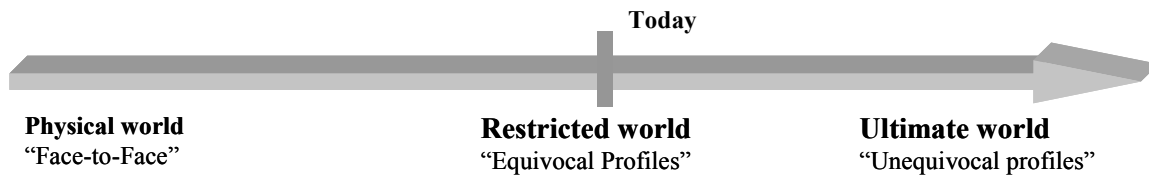
Today

Physical world | Restricted world | Ultimate world
"Face-to-Face" | "Equivocal Profiles" | "Unequivocal profiles"

Figure 5. Uniqueness Continuum

Universality

Universality incorporates the idea of merging devices and networks into universally usable and multifunctional entities.[8] Until recently, the available collection of mobile devices was limited in their usefulness because they are not universally usable. For example, most U.S. cell phones were unlikely to work in Europe because of different standards and network frequencies, and vice versa. Nowadays, cell phones are available, so-called tri-band devices, that are able to communicate with most network frequencies. An owner of a Nokia 6610, for instance, is able to travel in 100 different countries without having to switch phones (T-Mobile 2003).

Furthermore, the idea of universality also incorporates the idea of multifunctionality. Up to now, most devices were simple in nature and provided only a limited spectrum of functionality, e.g., phone calling capabilities only. Ultimately, we envision a world in which people can choose between devices that suit their task at hand in the best form possible, a world in which people can have a universal device that enables them to stay connected at all times and all places because networks have overcome differing standards, protocols, and frequencies and are globally integrated (Figure 6).
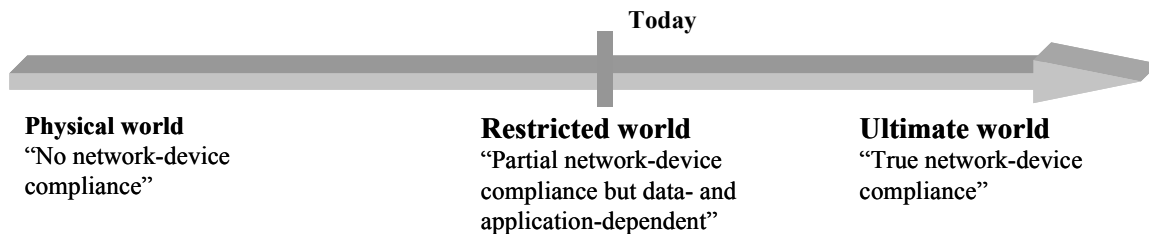
Today

Physical world | Restricted world | Ultimate world
"No network-device compliance" | "Partial network-device compliance but data- and application-dependent" | "True network-device compliance"

Figure 6. Universality Continuum

Unison

Unison covers the idea of integrated data across multiple applications so that people have a consistent view on their information—irrespective of the device used (Figure 7). Currently, unison is only apparent in a few examples. For instance, PDAs are able to synchronize with desktop computers; or e-mail can be checked using different applications (e.g., different browsers or e-mail clients). Most of the time, however, we encounter non-unison situations, such as with cellular phones. Typically, the address book stored on a cellular phone can be synchronized with only a few applications. Even worse, whenever we buy a new phone, the old addresses have to be inserted manually.

Ultimately, we envision a world where data are synchronized across multiple applications automatically. For example, the phonebook on a computer matches that on the cell phone and all other electronic phonebooks maintained. A change in one phonebook is transmitted to all others with complete transparency to the user. The same is true for any kind of files, such as multimedia documents, address books, diaries, to-do lists, and links to Web sites. All files are kept in unison so that the access medium becomes irrelevant.

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[8]Note that Lyytinen and Yoo (2003) subsume universality and unison under the construct of *digital convergence*.

Today

Physical world
"No data-application integration"

Restricted world
"Partial data-application integration but device- and network-dependent"

Ultimate world
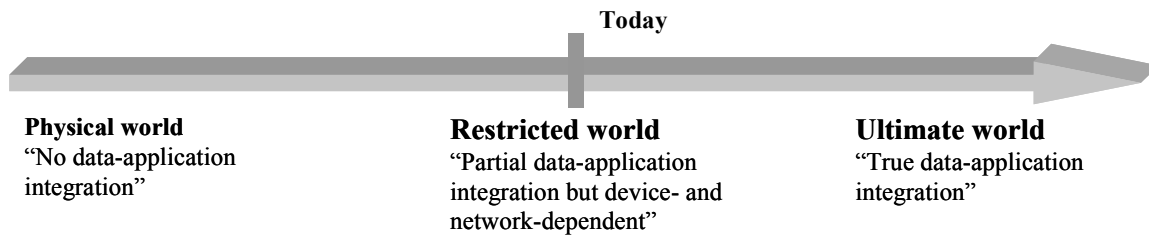"True data-application integration"

Figure 7. Unison Continuum

All four constructs were supported by interviews conducted with practitioners in the field. The interviews were unstructured in nature and were addressed to capture the domain of experiences individuals had with their mobile devices (cellular phones and PDAs). Excerpts of the interviews are listed in Table 1. For a more detailed analysis, see Junglas (2003).

Table 1. Excerpts of Interview Phrases

U-constructs	Phrases used by interviewees
Ubiquity	*"I don't have to think about [it], there is no limit to when or where I could call, I just do it."* *"Strengths [of mobile devices] are definitely mobility. You can be reached anywhere." "[Strengths are that] you are always available…and at the same time there [are] downsides that you are always reachable and everybody knows that you should be reachable."* *"You can always reach people unless they are flying."*
Uniqueness	*"And [I have a] kind of feeling that my filofax (a.k.a. planner) number address book lost its importance because I had them in my cellular phone and I always had the cellular phone with me."* *"They call you, they don't call your house, they call you, so this is my number, and so they call me and not just my house, and if they'd call my house they would accept if I'm…not there."*
Universality	*(Entering the U.S. and realizing that his Triband Mobile did not work) "It was quite a shocking experience because I was immediately at the same situation I have been all my life when I entered two years ago. I had to look for a public phone and [that was] quite a pain."* *"People would be on the move all the time, it didn't matter you could also reach them on the one number if they were in Sweden or Switzerland."*
Unison	*"I could synchronize on the mobile, on the PDA, and on the laptop having the same base of addresses, laptop and organizer having the same appointments."* *"I didn't use it that much for the Windows based programs in the end, I mean for Excel and Word and stuff, maybe for reading things, but of course not for like doing entire spreadsheets on the PDA because the display is far too far too small and the handling is too clumsy to work it out."*

Implications

The paper has elaborated upon a set of four new constructs, so-called *ultimate constructs*, or simply *u-constructs*. These u-constructs include ubiquity, uniqueness, universality, and unison, each of which is an outcome of the transitions between e-commerce and m-commerce, and m-commerce and u-commerce (Figure 8).

Electronic Commerce

Mobile Commerce

Ultimate Commerce

Ubiquity
Uniqueness

Universality
Unison

Characteristics:

Characteristics:

Characteristics:

Figure 8. The U-Constructs

Whereas *ubiquity* allows users to access networks from anywhere at any time and, in turn, to be reachable at any place and any time, *uniqueness* allows users to be uniquely identified—not only in terms of their identity and associated preferences, but also in terms of their geographical position. *Universality* covers the idea of devices being universally usable and multifunctional, and *unison* the idea of integrated data across multiple applications so that users have a consistent view on the their information—irrespective of the device used.

Each of the u-constructs spans a dimension along which information systems are able to advance. Some technologies provide high levels of one characteristic and low levels of others. The ultimate vision, however, is to create an information system that is strong on all four dimensions. Current information systems, in contrast, can be viewed as one particular manifestation or instantiation of the four dimensions. In the graphs below, different information systems are characterized by their degree of u-commerce-readiness. For simplicity purposes, we do not quantify the levels of u-readiness but use quantifications such as high, medium, and low instead.
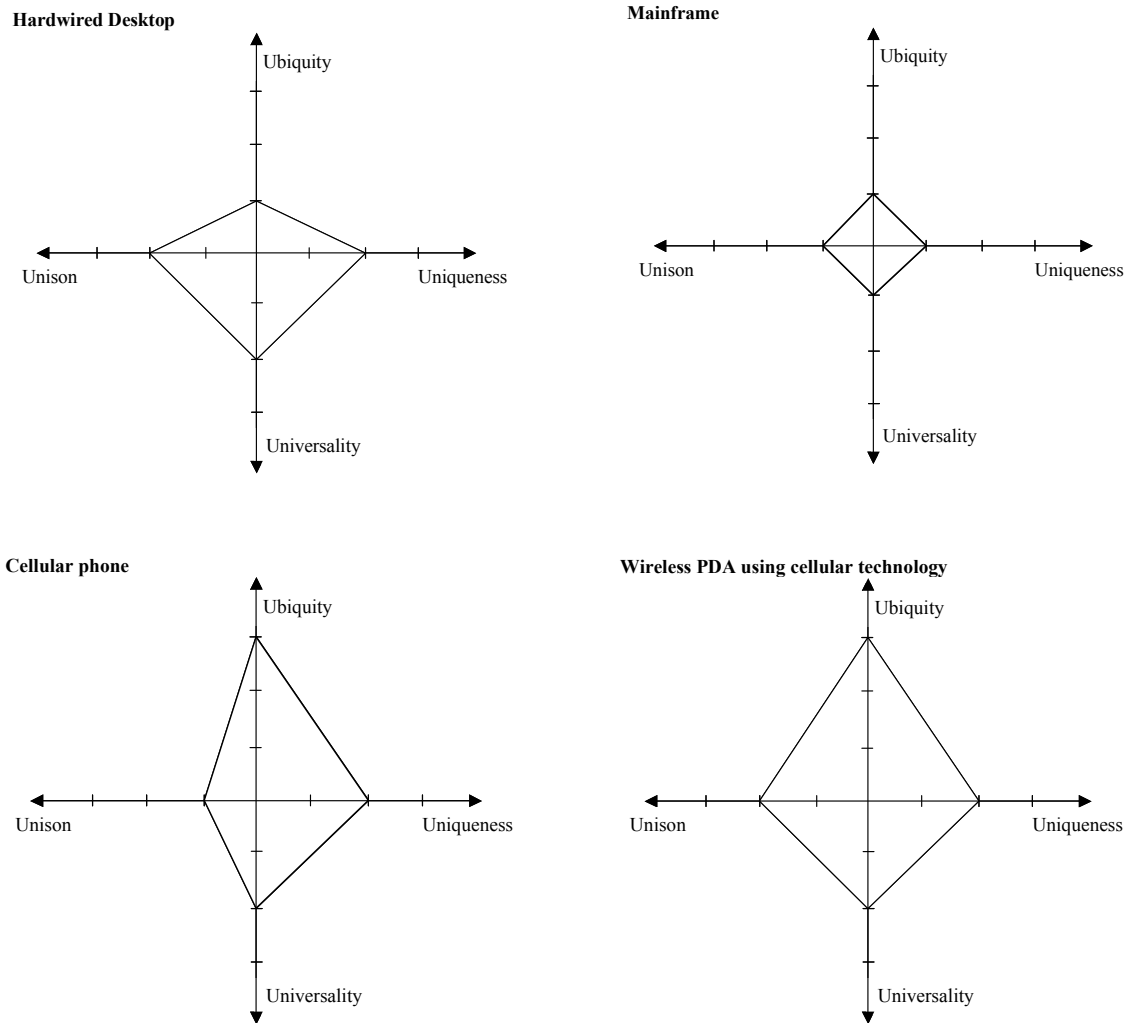
Hardwired Desktop

Mainframe

Cellular phone

Wireless PDA using cellular technology

Figure 9. Current IS and Their U-Commerce Readiness

Traditional desktop computers are low on ubiquity because a desktop is a stationary system and typically not portable; they are medium on uniqueness because they are personalized in most cases with personalization ranging from user interfaces to address books, organizers, favorites, etc. The highest level of uniqueness, however, would include localization capabilities—a feature that,

by default, is not available in hard-networked environments. Further, desktop computers are ranked medium on universality since they are compatible with a variety of networks but typically not with the entire spectrum; they are medium on unison since they allow synchronization with other devices, such as PDAs, but not with all. Mainframe machines, in contrast, do not provide any level of u-readiness. Interestingly, both devices represent the classical form of an information system that has been used for building most of our IS theories.

Cellular technology is currently the only technology species that provides the highest level of ubiquity. Mobile users can access networks and be reached via the network in most places. In contrast, cellular phones are equipped with a medium level of uniqueness capabilities only. The information stored on cellular phones is typically highly personal, such as phone numbers, addresses, and even mobile account information; however, they lack any localization component. With the E911 mandate to be implemented by 2005, cellular phones can easily turn into *truly* unique devices. Regarding universality, cellular phones provide a medium level only since compatibility frictions exist across devices, networks, and frequencies. Compared to PDAs with a cellular connection, cellular phones are low on unison because only a few applications are available that allow synchronization across devices whereas PDAs were designed with this particular purpose in mind and, therefore, rank at medium level.

In summary, each of the u-constructs spans a dimension along which information systems are able to advance. As such, u-commerce represents the next step in digitization as *true* ubiquity, uniqueness, universality, and unison will have profound implications—in particular to IS theories. Most of the IS theories were developed during the era of mainframe computing or end-user PC use where an information system was viewed as a processing unit that transformed data and instructions into reports while operating in an centralized fashion, used for organizational purposes only (Culnan 1987). With the emergence of u-commerce, we have to revisit some of these theories, but information systems will not be the only part of the revisions. Since technology is undoubtedly intertwined with the task that it is supposed to solve, a change in the nature of information systems also constitutes a change in the nature of tasks (Goodhue et al. 2001; Goodhue and Thompson 1995; Sørensen et al. 2002). For instance, an information system that is able to provide the ultimate form of any u-construct has the ability to change the nature of tasks. It not only facilitates tasks that used to be difficult to implement, but it also creates opportunities for tasks that were once nonexistent. For instance, receiving location-based information about a historical monument while driving past it, or doing on-line trading from any location on the globe are tasks that can easily be performed with the availability of u-commerce technology. A more detailed discussion about a modified task taxonomy can be found in Junglas (2003). Overall, it seems imperative that IS researchers will be forced to revisit and rethink some of the fundamentals of IS—and even invent new methods of research (Lyytinen and Yoo 2003).

For IS practitioners, the same considerations apply. As mobile penetration increases and applications become more sophisticated, the transformation of the mobile phone into a fully integrated data, communications and commerce tool seems inevitable (Kakikara and Sørensen 2002b; Lyytinen and Yoo 2003; Sørensen et al. 2002). As such, the u-constructs not only provide a means to understand the potential of future u-technologies but also are able to serve as an instrument for identifying u-commerce needs and evaluating potential business benefits. For businesses, u-commerce will be a critical capability in improving customer sales, service, and loyalty, and in driving more efficiency in the supply chain and in enabling mobile workforces.

For IS users, u-commerce technologies will become part of daily life, turning time previously spent waiting, walking, and traveling into time spent communicating, working, and buying (Agre 2001). With e-commerce and m-commerce morphing into u-commerce, the borderlines between private and professional life will blur even more since the notion of an information system is no longer bound to the organizational context.

The purpose of this paper was to point out the cornerstones of u-commerce that are important when studying future forms of information systems. It has by no means been meant as a comprehensive or rigorous explanation of things to happen; however, the paper claims to lay the groundwork for structuring future information systems and providing a discussion forum for trends in the field of IS.

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