

## Leveraging Presence in the Design of Mobile Services: Challenges, Opportunities, and Value Creation

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### Abstract

Recent industry white papers explore presence as one of the hottest, most valuable design trends for mobile services that has only recently been leveraged in designing mobile services. Building on this viewpoint and drawing on prior communication research, we show that presence is a much richer construct than these white papers suggest, and we more fully explore the application of three types of presence - physical presence, social presence, and self-presence - to mobile services design and to the corresponding opportunities for value creation. We present a series of design challenges to incorporating presence and develop the opportunities for overcoming these challenges. The implications of designing with presence are 1) a greater awareness of and response to the users' needs and behaviors; 2) strategies for top-down design that leverages this awareness; and 3) methods for integrating unique features of mobile devices based on user and environment-driven factors rather than technology-driven factors. Numerous real-world examples illustrate both the complete nature of presence and its application to mobile services.

**Keywords:** Presence; Mobile services design; Value creation

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# Leveraging Presence in the Design of Mobile Services: Challenges, Opportunities, and Value Creation

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## Abstract

Recent industry white papers explore presence as one of the hottest, most valuable design trends for mobile services that has only recently been leveraged in designing mobile services. Building on this viewpoint and drawing on prior communication research, we show that presence is a much richer construct than these white papers suggest, and we more fully explore the application of three types of presence - physical presence, social presence, and self-presence - to mobile services design and to the corresponding opportunities for value creation. We present a series of design challenges to incorporating presence and develop the opportunities for overcoming these challenges. The implications of designing with presence are 1) a greater awareness of and response to the users' needs and behaviors; 2) strategies for top-down design that leverages this awareness; and 3) methods for integrating unique features of mobile devices based on user and environment-driven factors rather than technology-driven factors. Numerous real-world examples illustrate both the complete nature of presence and its application to mobile services.

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## 1. Introduction

Recent industry white papers including Nokia (2004), Ericsson (2004), and Lucent Technologies (2004) address the notion of presence as the foremost design implication for emergent mobile services and applications. The growing interest in presence stems from the enormous success of instant messaging and its natural evolution toward presence-based applications which leverage real-time information about user, system, or device to enable users and applications to make more intelligent decisions about information and request routing (Sun, 2003). Currently, industry defines a presence service as any new type of service which shares information about a user's status (such as location, or user-defined schedule or preferred contact method) with other users in order to maximize communication efficiency and pleasure (Lucent-Technologies, 2004; Nokia, 2004). This notion derives from enhanced awareness of another social actor, an increase in social richness made possible by the enabling technology (Lombard & Ditton, 1997; Short, Williams, & Christie, 1976).

Presence is actually a much richer construct than what the above white papers imply. Advances in virtual reality, interactive media, and interface design have brought to light a far greater depth to what presence is and how it influences design (Lee, 2004). While presence is relatively new concept for mobile communication, it has been a central tenet in media and computer design for years. Media scholars, engineers, and computer scientists have long acknowledged that the feeling of presence is at the heart of all mediated or simulated experiences, from plain old telephone conversations to advanced virtual reality simulations (Lombard & Ditton, 1997)

The cumulative research on presence has failed to consider the implications of presence in the mobile environment and as such presence has been largely misunderstood and misapplied in the industry practices. In this paper, we try to address this problem by fully explaining what presence is, how it relates to the mobile environment, and how it can increase value to the users of mobile services and applications. We build on this understanding of presence to explain three major challenges of designing mobiles services and applications with presence and the opportunities that prevail over these challenges.

## 2. Presence and the Mobile Space

Experience can be categorized into three types—real experience, hallucination, and virtual experience (see Figure 1)—according to 1) ways of experiencing (sensory vs. non-sensory) and 2) objects that are being experienced (actual vs. imaginary vs. virtual [para-authentic vs. artificial]). Real experience is the sensory experience of actual objects. Hallucination is the non-sensory experience of imaginary objects. Virtual experience is the sensory or non-sensory experience of virtual (either para-authentic or artificial) objects.

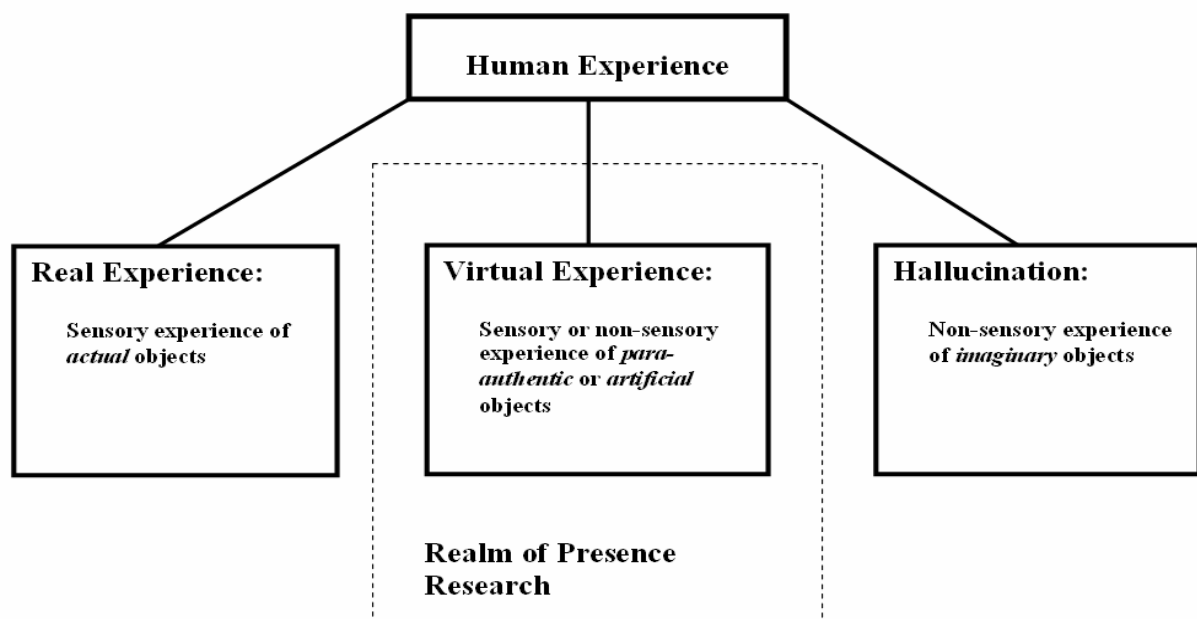


Fig. 1. Typology of Human Experience (from Lee (2004))

Presence concerns virtual experience, and is defined as “a psychological state in which virtual (para-authentic or artificial) objects are experienced as actual objects in either sensory or non-sensory ways” (Lee, 2004). Table 1 shows how virtual experience can be classified by mixing two characteristics of virtuality (para-authentic vs. artificial) and three domains of experience (physical vs. social vs. self), which results in six unique manifestations

of virtual experience in which presence has a particular meaning. The table also shows examples of mobile services and applications that leverage each type of presence in their design. These examples demonstrate how the presence typology helps conceptualize a larger range of presence services. Our primary objective is not to classify the complement of current mobile services, but rather to understand them from a presence perspective and use that basis to develop other services of value to mobile users.

Table 1  
Types of Presence and Their Manifestation in Mobile Services (based on Lee (2004))

Domain of Experience	Characteristic of Virtuality	Explanation of Virtual Experience	Examples in mobile services and applications
Physical	Para-Authentic	Experiencing virtual physical objects and environments which have authentic connection with the corresponding actual physical objects and environments	Monitoring home/office security systems through mobile devices; Multi-media mobile broadcasting of concerts; Location-awareness services (e.g., GPS); Icons on phone interface (e.g., signaling bar, battery status)
	Artificial	Experiencing virtual physical objects and environments artificially created or simulated by technology	Exploration of a mobile game world; Virtual location awareness in mixed reality games (providing virtual locations on top of real locations)
Social	Para-Authentic	Experiencing the representation of other humans connected by technology.	Simple phone conversation; Availability status (on or off line, home or office; call or SMS); Person identification services (e.g., distinctive ring tones; avatars); Presence-based CRM (where and when to contact a customer); Proximity alert (who's near to you?)
	Artificial	Experiencing artificial objects manifesting humanness	Social interaction with mobile interface agents; Agent-based mobile commerce; Mobile service agents with personality and emotion
Self	Para-Authentic	Experiencing the representation of one's own genuine self—either physically manifested or psychologically assumed—inside a virtual environment	Expression of one's own identity, personality, or emotion; Ring tones and melodies; Managing one's availability to others; Location-sensitive greetings or voice messages
	Artificial	Experiencing an alter-self, constructed—either physically or psychologically—inside a virtual environment	Constructing one's alter identity in mobile games; Location sensitive identity changes (e.g., student mode in schools, dancer mode in a party)

### 3. Reaping Value from Presence: A User Perspective

Based on analysis of previous studies of non-mobile technologies (Choi, Miracle, & Biocca, 2001; Lee & Nass, 2004; Lombard, Reich, Grabe, Bracken, & Ditton, 2000), we propose that presence is a psychological construct that partially mediates the value a user reaps from using a particular mobile service (see Figure 2).

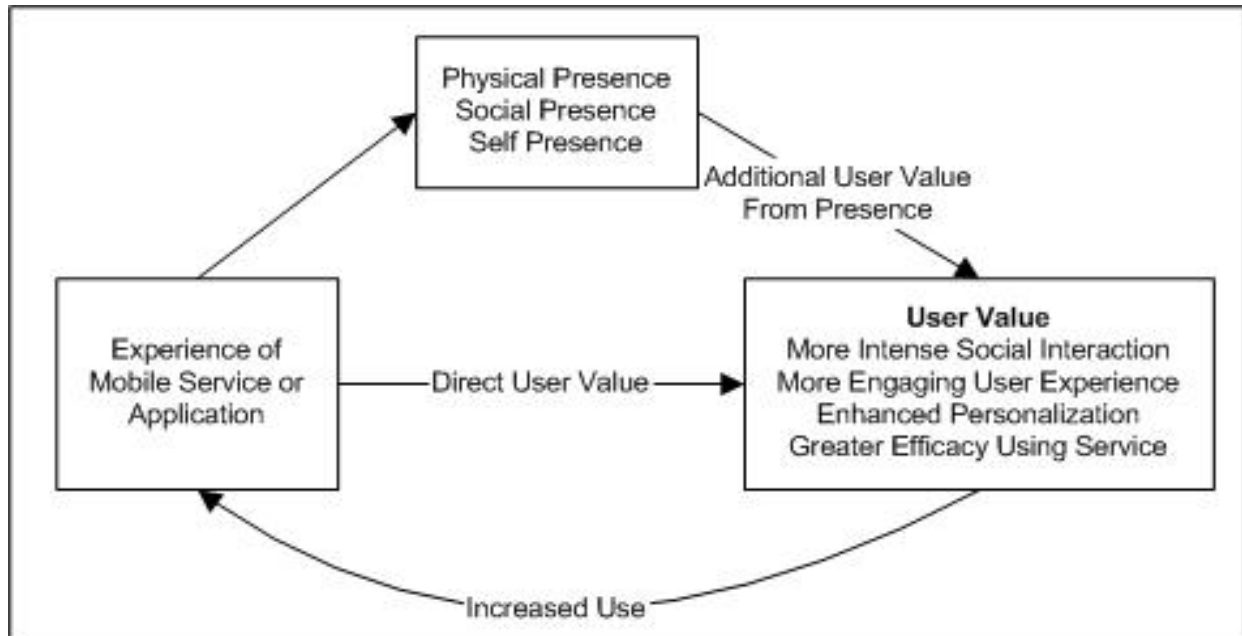


Fig. 2. Model of user value from mobile services enhanced by presence

The more presence a user perceives as she experiences a service the greater value the user takes away from that service. Research has shown this mediating effect in evaluations of internet-based artificial sales agents (Choi et al., 2001), evaluations of book reviews and subsequent intent to purchase (Lee & Nass, 2005), in performance of tasks using teleoperative systems (Sheridan, 1992), and in attribution biases from watching video clips on television (Lombard & Ditton, 1997). Studies on non-mobile technologies (e.g., virtual reality, game consoles, desktop computing, TV and film) have shown that presence contributes to a number of positive psychological and somatic effects (Lee & Nass, 2004; Lombard & Ditton, 1997) that mobile services users would find valuable, including the following four that we focus on here: *enhanced social interaction*, *engaging user experience*, *rich personalization*, and *great efficacy with the service or application*. These effects are of primary concern to mobile services which hinge on interactivity and identity management, both of self and others. While these effects are also prominent in other media (such as internet chat rooms) they are most directly tied to value creation and exploitation in the realm of mobility. Other noted effects from presence such as arousal, persuasion, and improved memory are possible from mobile media but have a lesser impact on user value and thus are excluded from the present discussion (Lombard & Ditton, 1997).

#### 3.1 Enhanced social interaction

Social interaction is the ability to be aware of, contact, and interact with others, including para-social (e.g. television characters) and artificial agents (Lee & Nass, 2005;

Lombard & Ditton, 1997). The ability to communicate with anyone, anytime, and anywhere is the most fundamental value of telecommunication applications. Presence helps users increase social interaction by fulfilling social mechanisms critical to interaction that would otherwise not occur in mobile media, such as a person's location, mood, or his/her appearance. For example, text-based chat systems allow users to convey emotional states by using emoticons which increase social presence. Location status can help a user find nearby members of their social network, leading to a physical meeting that otherwise might not have taken place. Device status (on/off) might signal to others one's availability and willingness to communicate (Jarvenpaa, Lang, Takeda, & Tuunainen, 2003). Because social presence mediates social interaction, mobile systems designed to produce high social presence can enable users to incorporate artificial social actors into their social network as easily as real social actors. For example, a rental car company might use regional dialects or accents in pre-recorded messages to users when the user arrives at a specific destination, or to make a user from a particular location feel more comfortable. Designing for social interaction means asking the question 'what makes people want to communicate with other people?' Presence helps us answer this question.

### ***3.2 Engaging user experience***

Creating a more engaging user experience is the classic application of presence and stems from research and design of virtual reality systems. Virtual reality is an attempt to simulate a real environment by simultaneously engaging multiple sensory channels with vivid and interactive stimuli. Multiple, rich sensory stimuli are not always necessary to create an engaging user experience, however. For example, Tamaguchi pets became widely successful based on interactivity and not graphical richness. The Tamaguchi pet's ability to act as an artificial social actor (albeit an animal) contributes to users' feelings of social presence and makes interacting with the non-vivid artificial pet appealing. Presence is the underlying phenomenon that explains why a certain combination of sensory and cognitive inputs leads to a more engaging user experience. It helps us to process input from artificial sources in the same way we would from real sources.

### ***3.3 Rich personalization***

Personalization refers to the ability to customize a mobile service to reflect unique and/or intrinsically important elements of a user's persona. Personalization is enacted by how we structure our virtual experience and respond to it. Through personalization, users activate, organize, and design thoughts, memories, and images about themselves that they find useful or pleasing. Personalization is highly valued by users of mobile services because typically these services are accessed on an individual's private mobile device yet are experienced often in public forums. If individuals only used mobile services in private environments there would be less interest in personalization. A sense of ownership, the desire to express personality in public forums, the availability of instant communication, and the size and feel of mobile devices (small, portable, and wearable) all are contributing factors to the value of personalization. Feelings of self presence can be regarded as the ultimate goal of personalization and thus can be used to measure the effectiveness of personalization services and applications.

### 3.4 Greater efficacy with the service or application

Efficacy is users' skills and competencies in using mobile services. Efficacy is particularly important for mobile services because many users experience difficulty operating mobile devices, impacting their subsequent use of mobile services. Presence helps users feel more capable using mobile services in two ways; it extends the users' sensory-motor and problem solving skills applicable in the physical world to the virtual world, and it reduces the complexity of the virtual world to make interaction via a mobile device more effective (Lombard & Ditton, 1997). The virtual context of a shopping mall for example, which indicates physical presence of an actual location, would help users find m-commerce sites with fewer scrolls and clicks, making the user feel more confident with their devices. Another example of how presence might aid in efficacy is by simplifying search. Physical presence (location) combined with identity management (self-presence) might simplify a search on "basketball" by returning nearby retail sporting goods outlets for a shopper, local pro and college game venues for a fan, and nearby parks or courts for an athlete. Venkatesh et al. (2003) find that relevance, structure, and personalization are key to usability and increasing efficacy. The examples demonstrate how presence helps operationalize these concepts.

## 4. Challenges/Opportunities to Leverage Presence in the Design of Mobile Services and Applications

Leveraging presence in the design of mobile services and applications requires an understanding of what leads to and influences enhanced presence. The factors in Table 2 have been linked to presence in previous media research; however the mobile environment is unique as reflected by the three challenges identified below. 'Challenges' seems an appropriate venue for exploring the application of presence as mobile designers and researchers are still seeking mobility's 'killer application' (besides voice communication). The challenges described here are three challenges unique to mobile services design due to the properties of the physical interface, the unique connectivity of overlapping ubiquitous networks, the individual modality of use, and the heightened connectivity of the mobile world. After describing each challenge we explore opportunities to use presence to overcome these challenges.

Table 2  
Factors influencing enhanced presence as shown from previous media research (adapted from Lombard and Ditton (1997))

Technology Factors	User and Social Factors
<ul style="list-style-type: none"> <li>▪ Consistency of multi-channel sensory information</li> <li>▪ Equipment comfort and ease of navigation</li> <li>▪ Fast response rate to user input</li> <li>▪ Image resolution, color quality, image clarity</li> <li>▪ Isolation from the real environment</li> <li>▪ Meaningful (narrative) media content</li> <li>▪ Modifiability of the virtual environment</li> <li>▪ Number of senses engaged</li> </ul>	<ul style="list-style-type: none"> <li>▪ Experience with virtual environments</li> <li>▪ Focused attention to the virtual environment</li> <li>▪ Mood (especially sensation-seeking mood)</li> <li>▪ Self awareness in the virtual environment</li> <li>▪ Personality similarity with real or artificial others in the virtual environment</li> <li>▪ Social realism (social response from real or artificial others)</li> </ul>

## **4.1 Challenge/Opportunity #1: Small can be Beautiful in the Mobile Space**

### *4.1.1 Understand how presence helps overcome what are seen as the limitations of the mobile form/content*

Most research in mobile form concerns the limitations of mobility, such as small screen size, poor screen resolution, difficult input devices, or poor feedback mechanisms (Venkatesh et al., 2003). Similarly, mobile content is discussed in limiting terms, dichotomized as either entertainment content (suitable for teenagers and time-wasters), or as productivity content (interesting only to a small niche of business practitioners). Users expecting desktop-computing size input and output and are disappointed in the mobile medium. For example, mobile devices are typified by smaller screens, low data transfer/throughput rates, small keyboards, and short battery life. Different hardware and operating system configurations, not to mention interoperability issues among multiple wireless carriers increase complexity and frustration.

### *4.1.2 Opportunity*

Physical, social, and self presence can help researchers to instead think of mobile form and content in terms of capabilities, convergence, and enhancement. High levels of presence may be fostered with surprisingly low-intensity technologies, such as computer-simulated voice, text, low-quality video, and sound [4, 5, 6]. For example, SK Telecom's ([http://www.sktelecom.com/eng/cyberpr/press/1196759\\_3738.html](http://www.sktelecom.com/eng/cyberpr/press/1196759_3738.html)) 1 mm service allows users to select a character image on their mobile phone which interactively guides the user through the wireless internet. The character is an artificial social actor who takes orders from the user via text messages. This interactive interface greatly reduces the complexity of navigating the mobile internet for users reliant on the small screen and buttons of a mobile device. The key is leveraging low-intensity technologies, user, and social factors (see Table 2) that are less impacted by the limitations of the mobile device/content for any particular application.

## **4.2 Challenge/Opportunity #2: Moving Together in Two Connected Worlds**

### *4.2.1 Understand how presence helps to enable the advantages of the mobile communication medium rather than taking them for granted*

Mobility imparts several advantages over traditional telephony and computing that presence can help designers more effectively leverage. Mobile devices are *portable*, (usable any place and any time), always with the user (expectation of accessibility), and proximal (not only 'with' the user but in contact or worn by the user). Secondly, mobile devices are *identifiable* through the network, which means they are addressable (digital identity), location-aware (and locatable), and constantly connected. Third, mobile content is *updatable*, supporting instant and dynamic content creation and manipulation (Nokia, 2004). Finally, mobile devices are *flexible*, permitting content and hardware personalization and device convergence (phone, camera, messaging, GPS, etc.) in one interactive device. Rather than utilizing these advantages separately the challenge to designers is leveraging the convergence and interactivity of these features.

## 4.2.2 Opportunity

Presence helps designers understand how to leverage the inherent advantages of the mobile medium by creating virtual environments to which users favorably respond. For example, Milewski and Smith's (2000) "live addressbook," a prototype mobile telephony system in which the dynamic status of distant parties was made available, allowed users to combine information about their location and status prior to communication and push that information to trusted contacts. This information then gave others access to the user's availability to accept different types of calls, their location based on which number to dial (home, work, mobile, etc.), and a personal message. The authors denoted these features as supporting 'personal presence' but we can more robustly classify some of these features as enabling social presence by enhancing the social fabric of the mediated communication, and some that led to self-presence by the real-time profiling of the self possible for each user opted-in to the live addressbook service.

Presence helps designers take a top-down approach to mobile services starting with the user's needs and working through the concepts of physical, social, and self presence to understand how to fulfill those needs using mobile technology<sup>1</sup>. For example, a world-wide massively multi-player mobile game might require visiting real locations and talking to real people that correspond to places and characters in the game - mixing portability, location services, identity management, and telephony - weaving the game world and real world together rather than relying on rich visual media to convey realizations of people and places. Another example is Earthcam Mobile (<http://mobile.earthcam.com>), an internet-based service that lets users create and populate online weblogs called 'moblogs' by sending digital pictures directly from the user's mobile phone as the pictures are taken. Users are also able to view their own live webcam on their mobile device and let others see snapshots from their webcam, and users may select and view live images from thousands of webcams across the globe. The on-demand availability of real-time imagery enhances physical presence which makes social interaction more intense and mobile applications more engaging.

## 4.3 Challenge/Opportunity #3. Hopping Seamlessly across Devices

### 4.3.1 Understand how presence helps users move seamlessly from one mobile device to another or from one mobile service to another

Seamless mobility has until recently referred to interoperability between networks, standards, and protocols such as 802.11 and cellular. From a technical standpoint, the goal of seamless mobility is enabling automatic and user-transparent switching over different networks, standards, protocols, and physical environments (Freescale-Semiconductor, 2004). But designing services for seamless mobility requires appreciating user needs that transcend connectivity concerns. Recognizing that differing media forms have their own unique characteristics, a service will not operate exactly the same across platforms. An application that is primarily visual, such as an internet-based mapping service available via PC will not translate directly to a hand-held mobile device which has a small visual interface. This is problematic for a service that seeks to encompass the user in a total harmonious experience transparent to the media form and function.

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<sup>1</sup> As one reviewer noted, the top-down approach has not led to the most successful applications in the past. However, we believe that the approach is sound, and what has been missing was the necessary understanding of the users' experiences – in terms of both their needs from, and responses to mobile devices and services.

### 4.3.2 Opportunity

Rather than making a service seamless and ubiquitous by virtue of its features, designers should instead look at the user's expectations from a service with regards to how that service engenders presence. Presence, as was previously shown, mediates the value a user takes away from using a mobile service. For example, recognizing that social presence underlies the value of interacting with a virtual sales agent (Choi et al., 2001), a mobile commerce application would emphasize the social interactivity of the agent and de-emphasize graphical appearance, which on a fixed internet might be a more valuable feature. Engendering greater social presence might involve use of synthesized voices or sounds that are tailored to users' personality or demographic profiles. These tailored voices or sounds can be activated based on users' location within a virtual store. The experience with a virtual sales agent changes only subtly (e.g., the use of same voice across different platforms), maintaining the illusion of consistent interpersonal interaction. Seamless mobility therefore is better thought of as maintaining physical, social, and/or self-presence across a variety of mobile devices rather than the continuation of any particular feature or set of features. In his 2004 web cast, Motorola CEO Ed Zander proclaimed that he wanted to "take my tv with me on the go," in reference to the availability of tv and video content on many Motorola mobile devices (<http://www.videonewswire.com/motorola/motomedia/>). But really, Zander was referring to the physical presence engendered by video and audio presentation of news, sports, and movies. A user who expects the exact same picture as a 54" widescreen tv on a 2x3 inch screen is bound to be disappointed. What Zander really wants is instantly available news and entertainment content in a dynamic media such as video. Designers can bring him the tv experience he desires on a mobile device via menu-driven downloads of short video clips on a range of topics (news, sports, etc.), time or location-based content pushed directly to his mobile device based on his location and digital identity (weather, traffic, breaking news or sports), and video teleconferencing so the user can 'watch tv' simultaneously while connected to one or more friends watching the same content, even if they are thousands of miles apart.

### 4.4 Summary

In this section we have discussed several challenges to designing mobile services that can be overcome to a great extent by a better understanding of, and incorporation of presence into mobile services design. Several examples illustrate the opportunity for designers to use the presence framework to help understand user behaviors and needs. The opportunity to overcome difficulties porting content across media forms is particularly useful because it shows designers how to integrate mobile services with existing services in other media, such as e-commerce, television and video broadcast, and gaming. Presence will also help designers make better use of more recently emergent technologies for mobile devices such as Bluetooth enabled personal-area networks. Presence provides a holistic (physical, social, self) perspective rather than a techno-centric perspective on design and usage which has been somewhat missing in mobile services design, to its disadvantage.

## 5. Conclusion

In this paper we have sought to bring the concept of presence to the design of mobile services and devices. We have strived to make presence a more concrete and tangible construct than it has been considered within the telecommunication industry for years, by offering numerous examples of how feelings of presence resulting from the use of mobile

services such as location-based proximity alerts, personalization services, consistent interaction partners across platforms can maximize user values. In order to explain why presence is a useful concept in the design of mobile applications and devices, we identified four ways users value mobile services and linked them to the three types of presence. We also proposed that presence has a mediating influence on the values that users acquire from using mobile services. We then described how designers should incorporate presence into mobile services by way of three successive design challenges: overcoming the limitations of the mobile media, leveraging the inherent advantages of mobile media, and designing for seamless mobility between mobile devices. It is our hope that both researchers and practitioners will take away a better understanding of the concept of presence, and will appreciate the value presence brings to the design of mobile applications and devices.

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