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Personal ICT Ensembles and Ubiquitous Information Systems Environments: Key Issues and Research Implications

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Abstract:

Personal information and communication technologies (ICTs) have become commonplace. Today many people own, or have access to, a range of different computing and communication devices, information technologies, and services, which they incorporate into their everyday routines. Increasingly, these technologies impact the way that individuals work, socialize, and play. Workers are bringing their personal ICTs to the office, and organizations are tailoring their computing environments toward ubiquitous integration with personal ICTs. These developments are opening up new ways of working, but they also create new challenges for organizations in accommodating this "nonaffiliated" use as part of their information systems environments. In this article we propose a framework for analyzing the composition and impact of personal ICT ensembles. The framework is positioned as pre-theory that invites further development and empirical testing. We illustrate how the proposed framework could be applied to consider personal ICT use across the work/home context. Several implications stemming from the notion of a personal ICT ensemble are highlighted, including practical considerations for nonaffiliated use in organizations. We conclude with suggestions for further development of the proposed framework.

Keywords: nonaffiliated use, personal ICT at work, ICT and perceived quality of life, personal ICT ensemble, ubiquitous computing, mobile information systems

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I. INTRODUCTION

By enabling access to computing resources from multiple locations and on multiple devices, ubiquitous computing has blurred the traditional demarcation between computing contexts. Computing at work can include the use of personal ICTs, with employees increasingly bringing their own devices to the office (often called BYOD, with devices including smartphones and tablet PCs) and using third-party computing services (such as VoIP and cloud services) in carrying out their work duties. This “nonaffiliated” use, i.e., personal ICT use by individuals for work/professional purposes, has typically remained outside the control domain of the traditional organizational IS support function.

The traditional home computing context is also changing as individuals seek more flexible forms of employment, such as working from home. Many organizations are accommodating these developments by providing facilities such as virtual private networks and software license agreements that allow the installation of work applications on home computers and by enabling access to corporate systems from private mobile devices. Developments such as social networking and the convergence of computing and media are further blurring demarcations between ICTs that are intended for “work” and those intended for “leisure.”

The purpose of this article is to develop a framework to help explain contemporary ICT use behaviors that tend to span traditional bounded IS use contexts (work, home, leisure, etc). We propose a framework that places the focus on individuals and accommodates their multiple and conflating roles such as employee, family member, entertainment seeker, and member of society. The framework casts light on various individual motivations which manifest in the range of devices/technologies that individuals might choose to acquire, shifting the focus from device acquisition *per se* to understanding acquisition and ongoing use decisions in the context of ubiquitous access to computing. A better understanding of all these considerations forms a useful backdrop for organizations in deciding how to accommodate and support nonaffiliated use (e.g., in terms of BYOD services, use policies, software license arrangements, etc.).

When we consider the global, mass adoption of personal ICTs (with Cisco [2013] predicting that the number of mobile devices in use will soon exceed the world’s population), we concur with Yoo [2010] that ubiquitous computing should be considered as an “emerged,” post-adoption phenomenon. Personal ICTs are today well-entrenched in the everyday lives of many people, but, as the diversity and ever-expanding range of personal ICTs could represent some scoping challenges for researchers, we suggest that the research focus should no longer be on the technology *per se*, but instead on its *affordances* [Gibson, 1977] as perceived by the user. We use the term *affordance* to refer to the perceived and actual properties of an ICT that allows the individual to perform an action (a view consistent with Norman [1999]). As McGrenere and Ho [2000, p. 2] observe, “affordances cut across the subjective/objective barrier. They are objective in that their existence does not depend on value, meaning, or interpretation. Yet they are subjective in that an actor is needed as a frame of reference.” The notion of an affordance is thus tied to how a particular individual perceives and engages with personal ICTs. For example, a smartphone could afford calling, entertainment, navigation, etc., depending on individual frames of reference. The affordance notion (which is inherently related to the individual frame of reference) resolves the difficulty often encountered with technology classifications. For example, a portable mass storage device has both utilitarian and hedonic affordances, depending on whether the individual uses it for work or leisure (e.g., as a repository for entertainment content).

We propose that an individual’s collection of personal ICT devices and services (the personal ICT ensemble) should be conceptualized, therefore, as a *set of affordances*, purposely constructed by this individual to support typical routines across the multiple contexts of his or her life. This conceptualization can liberate researchers from the complexity associated with focusing on multiple features and functionalities spread across all the technologies and devices a particular individual may use.

Recognition of the multiple roles and use contexts in which an individual may engage with personal ICTs then calls for an encompassing, individually-focused construct to consider particular individual motivations and choices. We propose *quality of life* (QoL) as a particularly useful construct in this regard.

The article consists of three parts. In Section II we illustrate the complexity of ubiquitous computing environments, exploring the convergence of organizational and personal use enabled by advanced personal computing technologies. In Section III we propose constructs that can help explain personal ICT decisions and explore personal

and organizational impacts of such decisions. In Section IV we consider broader implications for advancing the IS research agenda in this area.

II. PERSONAL ICTS AND UBIQUITOUS USE CONTEXTS

In this section we highlight several considerations that are pertinent to research that explores personal ICTs and the ubiquitous contexts in which these technologies are used.

New Use Behaviors Enabled by Personal ICTs

Smartphones and tablet PCs are exemplars of personal ICTs, offering users Internet access, telephony, entertainment, and productivity support all in single highly portable devices. Hong and Tam [2006] note that the important distinguishing features of such devices include the fact that they are mobile and that they are adopted by individuals for their own personal usage. These features of personal ICTs enable such technologies to be incorporated into individuals' everyday lives (for personal and work purposes). Further, Watson, Berthon, Pitt, and Zinkhan [2004] observe that, in a ubiquitous computing environment, individuals tend to have personal technologies with them for much of their waking hours.

Personal ICTs are commonly used in multiple contexts (e.g., work, home) and for multiple purposes. As a result, complexities arise relative to cross-context behaviors and related technology configurations. For example, individuals may apply processes and tactics from the work context to their own domestic management (e.g., syncing calendars with family members), or conversely they may be able to employ tools initially designed for social interaction in the workplace (e.g., microblogging). These emerging phenomena suggest research questions that would pertain to explaining unprompted decisions, predicting future interactions, and guiding designs to capitalize on synergies.

Personal ICTs as Ensembles of Affordances

Although many personal ICTs offer a range of functionality within a single device, Carroll [2008] found that individuals assemble a portfolio of devices to suit their personal needs in supporting their daily activities rather than relying on a single device. Noting that much IS research has conceptualized the IT artifact as a single device or system, Carroll calls for more research based on a portfolio approach in order to develop better understandings of “why technologies are selected, combined, adapted and applied by people on the move” (p. 15). Although some researchers (e.g., Richardson and Benbunan-Fich, 2011) argue that the multifunctional nature of personal devices like smartphones and tablets allows individuals to rely on single devices, we concur with Carroll that individuals frequently use a plurality of devices (a behavior illustrated by Dery and MacCormick, 2012). However, rather than understand this plurality in terms of devices alone, we suggest a more subtle approach that considers the affordances enabled by this personal ICT ensemble.

Consider contemporary high-end devices such as smartphones and tablet PCs. These devices offer significant diversity in terms of the functionality provided to the user (e.g., productivity software, camera, navigation, Internet connectivity, entertainment). Individuals may select any number, from all to perhaps only one, of these functions for their own use. Although some value may be derived from the study of the set of features packaged in any one device, we suggest that the value from the user perspective could be better illuminated by treating each feature as a particular affordance selected explicitly by the individual. Note that individuals may “invent” additional affordances beyond those anticipated by the designers by using the devices in unanticipated ways (Carroll, 2008).

We see a number of questions arising naturally from this conceptualization of personal ICTs as an ensemble of affordances chosen by users. Why do individuals select the set or components they do? Are there common patterns of characteristics that can be identified?

The Centrality of User Agency

Recognition that personal ICT ensembles are purposefully managed marks a departure from the idea of technology *acceptance*. Acceptance implies that users are passive recipients of technologies, unable to exert agency in their adoption decisions. Schwarz and Chin [2007, pp. 234–235] explore meanings of acceptance and conclude that there are five “psychological modes of acceptance”—to receive, grasp, assess, be given, and submit. Each of these implies that the decision regarding technology adoption rests with someone other than the user. But, with respect to personal ICT ensembles, we believe that user agency is central to the compilation of an ensemble. Individuals assemble technologies (devices and services) that provide a specific set of affordances that are beneficial to them and help to enhance their lives at a particular moment in time. In the context of personal ICTs then, the agency for decision making rests primarily with the individual adopters, not with their organizations, managers, or others. A



focus on user agency also allows for consideration of users as individuals, rather than attempting to categorize their anticipated behaviors based on their demographic characteristics.

Understanding the Personal ICT Ensemble in Use

To date, research that considers the impacts of converged mobile, personal, and professional technologies acknowledges that within personal ICT ensembles, personal and professional uses are tightly intertwined and often inseparable [Scheepers, Scheepers and Ngwenyama, 2006]. Such research addresses issues like the concerns of managing work–life balance in the context of blurred boundaries between personal and work environments [Cousins and Robey, 2005; Cousins and Varshney, 2009; Golden and Geisler, 2007; Middleton, 2008; Sarker, Xiao, Sarker and Ahuja, 2012], satisfaction with mobile devices [Chesley, 2005], and the possibility of dysfunctional or paradoxical outcomes as contexts converge [Jarvenpaa and Lang, 2005; Middleton and Cukier, 2006].

However, despite the ubiquity of personal ICT use, there is much to learn about the key motivations behind the composition of personal ICT ensembles. This is a pressing concern, given the enthusiasm for personal ICTs and the optimism about the social, economic, and civic impacts that may accrue from their usage [Dutta and Bilbao-Osorio, 2012; International Telecommunication Union, 2012]. We explore these issues in the next section.

III. A FRAMEWORK FOR PERSONAL ICT ENSEMBLES

In response to the considerations highlighted in Section II, in this section we propose a set of constructs that can be used to analyze the composition of personal ICT ensembles and consider their impact for individuals and organizations.

Quality of Life

We start from the assumption that behavior relating to the composition of a personal ICT ensemble is dynamically intertwined with individual perceptions about quality of life (QoL). Anticipated impact on QoL influences the choices that people make in deciding what is relevant for inclusion in their personal ICT ensembles, as the affordances provided by an ensemble can directly enhance or detract from quality of life on a day-to-day basis. Determinants of whether specific affordances enhance quality of life will vary between individuals, of course (for instance, is always-on access to email a good thing or a bad thing?), but we argue that the personal ICT ensemble can be understood only against a backdrop of how a particular individual perceives his/her quality of life. As such, the perceived improvement of QoL (for instance, by making it possible to communicate with friends and colleagues while away from home and the office, having access to information from any location or being able to record audio and video with a simple device) is central to explanations of how and why individuals tailor their ICT ensembles over extended periods of time and marks a different way of understanding how some of the IT needs of organizations can be satisfied as components of personal ICT ensembles make their way into organizations.

The concept of quality of life has received much attention, especially in the social sciences and medical-ethical literature. Definitions range from narrower meanings in medical ethics (e.g., quality of life of a terminally ill patient) to broader societal conceptualizations relating to individual well-being. In this article we adopt the broader societal conceptualization of quality of life. Specifically, we draw on the rich tradition that exists, especially in the Nordic countries, regarding the assessment of the overall quality of life of citizens. This tradition emanates from the ideals of the welfare state which were adopted by many countries in continental Europe after the Second World War. In this context, the notion of “welfare” translates more correctly as individual well-being or quality of life. In considering how individual quality of life can be assessed, we draw on the work of sociologist Erik Allardt who proposed a set of measures derived from several decades of national quality of life surveys in the Nordic countries [Allardt, 1972, 1976, 1993; Allardt and Uusitalo, 1972].

Allardt groups the various measures into three main QoL dimensions, which he labels Having, Loving, and Being.¹ *Having* encompasses all the material aspects needed by an individual for survival and avoidance of misery. This includes the basic human needs (nutrition, water, shelter, etc.) which are typically assessed by measures such as an individual’s economic resources, housing conditions, employment, working conditions, health, and level of education. *Loving* encompasses the need to relate to other people and to establish social ties. This dimension is assessed by measures such as the individual’s contacts with the local community, relationships with friends and family, contact with members of associations and organizations, and relationships with colleagues. *Being* relates to the need to integrate into society and live in harmony with nature. *Being* encompasses positive aspects (e.g., personal growth) and alleviation of negative aspects (e.g., alienation). Measures include the extent to which the

¹ Allardt and Uusitalo [1972] note a “rough correspondence” between their QoL measures and Maslow’s hierarchy of needs.

individual can participate in decisions and activities that influence his/her life, political activities, opportunities for leisure, having a meaningful life, and opportunities to enjoy nature.

We draw on the Allardt framework for the following reasons. First, as we shall subsequently indicate, parallels can be drawn between the Having, Loving, Being dimensions, the categories of personal ICT use [Kim and Han, 2009], and the likely contribution that ubiquitous personal ICTs can make to individuals' quality of life in eleven life domains observed by Choi, Im, Lee and Kim [2007]. Second, Allardt's framework encompasses multiple roles of the individual (e.g., as a private person, employee, member of a family/society, citizen). As such, Allardt offers a richer theoretical construct in terms of quality of life theorizing than Maslow's hierarchy of needs. Third, the Allardt framework includes objective measures (deterministic needs satisfaction), but also some subjective evaluations ("happiness" measures) which, arguably, encompass much of the richness of an individual's quality of life perception. We contend that the Allardt measures can be adapted readily to analyze the perceived impact of personal ICT ensemble usage on individuals' quality of life.

An individual's overall perception of quality of life, of course, is dependent on a wide variety of factors and is influenced by individual attitudes, world views, personal circumstances, etc. We postulate that the contribution of ubiquitous personal ICTs to the individual's overall quality of life, both at work and at home, is but one of these factors. Specifically, we contend that for many individuals today, the technology experience of their ICT ensemble does matter in terms of their overall quality of life, a view consistent with Choi et al. [2007], and Techatassanasoontorn and Tanvisuth [2010]. The constructs proposed in this article, therefore, are aimed at explaining the personal ICT decisions for those individuals who choose to incorporate ICTs into their daily lives, including their work life, and informing an understanding of the broader impact of such personal ICT decisions on the organizational IS environment.²

Personal ICT Experience Satisfaction

We follow Choi et al. [2007] and use the term *experience satisfaction* to denote the individual's satisfaction with the use experiences of personal ICTs in relation to quality of life. "Experience satisfaction" in this regard can be considered a more apt label than "satisfaction" alone, since personal ICTs encompass not only traditional information-centric outcomes (cf. Bailey and Pearson, 1983; Doll and Torkzadeh, 1988; Wixom and Todd, 2005), but also media and entertainment "experiences" [Choi et al., 2007; van der Heijden, 2004]. In terms of experience satisfaction, the affordances of a particular ICT and the individual's abilities are related [Greeno, 1994]. Depending on personal abilities (e.g., technical know-how, prior experience, and individual innovativeness [Yi, Fiedler and Park, 2006]), a particular individual could have a deeper experience, given the affordances of a particular ICT, compared to an individual with less ability in that regard.

In the case of personal ICT ensembles, experience satisfaction has multiple dimensions. When we disaggregate the different affordances of particular ICTs in an ensemble (as shown in Table A-1), we gain the precision to analyze the individual's utilitarian, connective, and hedonic experience satisfaction. This would enable the researcher to examine, for example, why an individual might have a high connective experience satisfaction with one or more elements of the ensemble, yet be dissatisfied with, say, the hedonic experience that particular element provided. As a specific example, differing types of experience satisfaction could explain why an individual might carry two mobile phones. The connective affordances of one phone might improve quality of life by enabling effortless, stress-free communication with colleagues, but if the hedonic experience was poor, a second phone might be included in an ensemble to provide improved hedonic affordances. Likewise, an individual might find the utilitarian affordances of a tablet greater than those of a smartphone and thus improve utilitarian experience satisfaction by adding a tablet to the ensemble.

The Framework

We now propose a framework to integrate the constructs outlined above. We begin with the personal ICT ensemble as created by a particular individual; this generates global and detailed judgments regarding personal experience satisfaction, and, in turn, personal experience satisfaction influences quality of life. We see that ICT ensembles reflect generic sets of affordances (as categorized in Table A-1). We see personal experience satisfaction measures related to each of these sets, and we see quality of life measures related to Allardt's dimensions.

Individuals seek different affordances from their ICT ensembles, personalizing them to reflect their needs to support and enable the various roles they play. Driven by a desire to improve their quality of life, individuals carefully add

² Further, while QoL could be viewed as providing a dependent variable for the purpose of simply evaluating effects of adopting personal ICT ensembles, we see this as potentially a much richer concept that motivates development, use, and innovation in personal ICTs as well as serves as a measure of outcome.

affordances to ensembles to provide utilitarian, connective, and hedonic satisfaction. There is no reason, however, to expect that all three levels of satisfaction will influence all three QoL measures. As illustrated in Figure 1, we propose (a) that the individual's utilitarian experience satisfaction mainly contributes to the Having dimension of quality of life; (b) that the connective experience satisfaction contributes to Having, Loving and Being; and (c) that the hedonic experience satisfaction contributes to the Loving and Being dimensions.

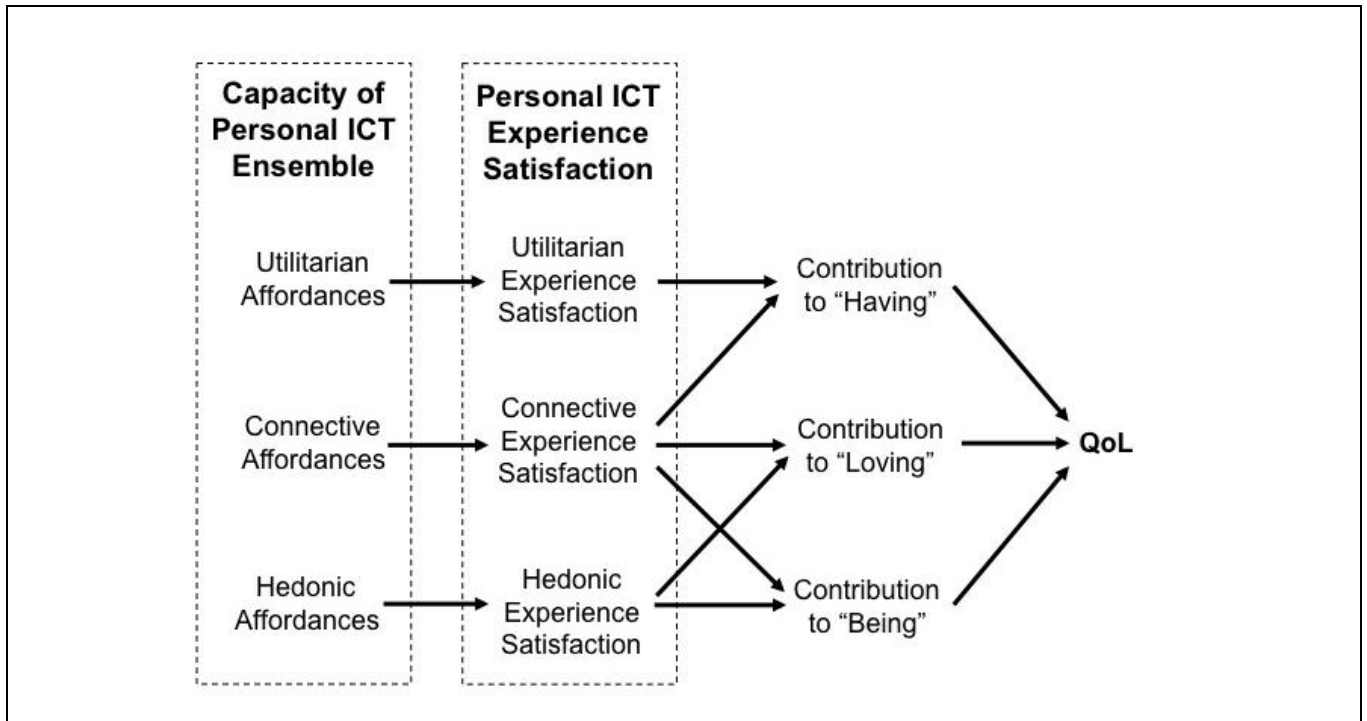


Figure 1. Analyzing a Ubiquitous Personal ICT Ensemble: Capacity, Experience Satisfaction, and Contribution to Quality of Life

The Role of Detractors

Thus far we have suggested how personal ICTs could positively contribute to the individual's quality of life. However, other factors associated with personal ICTs potentially have a significant negative impact on the individual's quality of life. Cenfetelli [2004] examined inhibitors of technology use, observing that inhibitors are not just the opposite of enablers, but that they are independent constructs that negatively impact on individual perceptions in the context of technology use. Cenfetelli defines inhibitors as the perceptions held by a user about a system's attributes, which act solely to discourage use (p. 495). Consistent with this logic, we use the term *detractor* to specifically denote a perceived negative impact on quality of life associated with a particular ICT. Detractors include high financial costs, switching costs, poor usability, steep learning curves, incompatibility, risks (e.g., security threats, the invasion of privacy, identity theft) and even recent phenomena such as technology addiction [Kakabadse, Porter and Vance, 2009]. Individuals will attempt to minimize detracting technologies and devices in their ensembles to reduce their negative impacts on quality of life, but may have to compromise when an affordance that provides satisfaction on one dimension acts as a detractor on another (e.g., the always-on connectivity afforded by mobile email may detract from hedonic activities).

Scope and Applicability of the Proposed Framework

We position the proposed framework as applicable to analyze individual technology-use scenarios that specifically involve *multiple* contexts (e.g., work, home, leisure) and *cross-context* considerations. These considerations underpin the particular set of affordances that a particular individual might choose to incorporate in his/her particular ensemble. In turn, this raises the need for a unifying construct such as quality of life that can encompass such diversity from a particular individual's perspective.

This distinguishes the proposed framework from other theoretical models that imply singular use contexts. Technology-use scenarios that typically involve a singular context (e.g., an ERP in the work context or entertainment systems at home) thus fall outside the scope of our proposed framework. Such use scenarios are addressed by existing theoretical frameworks such as TAM and UTAUT and hedonic variants of these (e.g., Brown and

Venkatesh, 2005; van der Heijden, 2004), with independent and dependent constructs tailored to these particular use contexts.

The focus on multiple and cross-context use in the proposed model, therefore, also can accommodate different ensemble archetypes. For example, in an ensemble with a strong work emphasis, the majority of affordances would typically relate to the work context (i.e., primarily utilitarian and connective), with fewer home or leisure (hedonic) elements. The opposite would apply to an ensemble with a strong home emphasis, whereas a mixed ensemble might have no particular contextual emphasis in the set of affordances. Recognizing archetypical ensembles allows for more precision when analyzing the impact of detractors on the individuals' overall quality of life. For example, a detractor associated with home use would likely have a lower impact on overall quality of life in an ensemble with a dominant work emphasis compared to, say, one with a home emphasis.

IV. IMPLICATIONS FOR RESEARCH AND PRACTICE

In this section, we illustrate the usefulness of the proposed framework through some analytical examples. We highlight several implications for research and practice.

Explaining Personal ICT in Work Contexts

Given the framework, how could we analyze personal ICT use in work contexts? As pointed out earlier, work contexts today are not necessarily bound to a particular physical location. The notion of a personal ICT ensemble and its contribution to an individual's quality of life offers a richer explanation as to why employees are bringing their own ensembles to work.

When an individual chooses to include work-related affordances in his/her personal ICT ensemble, it could be argued that this person is seeking to optimize his/her overall QoL. For example, particular affordances (such as being able to connect to organizational IS, work email, etc.) could contribute to the individual's quality of life in the sense of adding more flexibility in terms of where and when this particular individual engages with the office. For a particular individual (e.g., one with a strong work emphasis in his/her ensemble), these different potential contributions to QoL might outweigh the potential detractors (e.g., being reachable all the time), thus yielding a net perceived positive impact. Of course, this impact would depend on individual perceptions as to whether particular affordances contribute or perhaps detract from QoL, and so an analysis must be individual-, and situation-specific. Consider that for another individual, such work-related affordances might actually be perceived as a net negative impact on QoL (e.g., if being contactable by colleagues after hours is viewed as a significant detractor).

On one hand, the inclusion of, say, utilitarian and connective affordances in a personal ensemble might add a level of efficiency for a particular individual. For example, mixing work and pleasure (e.g., including affordances to enable sales discussions with one's golf partners), might be achieved more efficiently as part of a personal ensemble. On the other hand, the inclusion of hedonic affordances might also be a distraction when one needs to concentrate at work. These potential trade-offs and dilemmas suggest fruitful areas of future research.

The inclusion of work-related affordances in an ensemble can clearly be accounted for in terms of their contribution to the Having dimension of QoL. However, for many workers today, work implies a deeper concept that extends well beyond a source of revenue toward aspects such as social/peer recognition and identity/status. Hence, we suggest that the Loving and Being dimensions of QoL also are central when analyzing the overall impact of affordances in a personal ICT ensemble that relate to the work context. This illustrates the merits of the three-dimensional quality of life construct in the framework insofar as it can offer a more comprehensive explanation of why individuals would include particular work-related affordances in their personal ICT ensembles.

Changes to the Personal ICT Ensemble over Time

Individuals' ICT ensembles evolve over time. For simplicity, we have articulated the proposed framework as a "snapshot" model. Further research should refine the model, e.g., in terms of the various mechanisms and triggers, and potential feedback loops that all contribute toward the evolution of a personal ICT ensemble. As argued earlier, the centrality of user agency suggests that the individual is a primary orchestrator of this ongoing evolution. In line with the framework, we propose that individuals constantly consider how to improve their quality of life by the inclusion of new affordances. In this respect, social influence (e.g., friends/family, the popular media, marketing messages of vendors), ongoing technological innovation, or the breakdown of a specific ensemble element, could all trigger ensemble evolution, leading to the incorporation of new affordances to the ensemble or the replacement of defunct ones. Further research could explore if, when, and how users respond in this regard. In line with the predictions of Rogers [1995], some individuals would typically respond more quickly than others would, immediately drawing connections between new affordances and the potential impact on quality of life. Others might respond later or even resist change until they have no other choice (e.g., when an ensemble component breaks down or a

standard is discontinued). In this regard, detractors, such as the start-up or learning costs of adopting a new component, will form part of the individual's consideration regarding the overall impact on quality of life.

Given the complex array of functionalities that are often preinstalled by vendors, another interesting research avenue is to explore when and how individuals become aware that they actually have certain affordances at their disposal. Building on the adoption literature (e.g., Rogers, 1995) and more detailed description of evolution of personal ICT ensembles, e.g., commencing with affordance awareness, trial, incorporation, adaptation, and routinization, represents another fruitful area for research with significant practical implications. Again, the quality of life construct could bring new perspectives to this extant literature.

Extending the Scope of Organizational IS Use to Include Nonaffiliated Use

We expect that individuals will continue to incorporate elements that are geared toward work/professional use in their personal ICT ensembles. In turn, from an organizational perspective, we believe this will increase the significance of nonaffiliated use in years to come. From a research perspective, therefore, we foresee the need for a broader conceptualization of IS in organizational contexts to encompass nonaffiliated use. Just extrapolating concepts (such as usefulness) that originate from traditional organizational IS use to nonaffiliated use might close off, rather than open up, such new lines of thought. This underpins the need for theoretical models and constructs that offer richer explanations of ICT use in the contemporary organization.

Such a broader conceptualization of IS use would, in turn, raise new areas for research. For example, what are the consequences (e.g., in terms of employee impact, productivity, security risks, cost of BYOD services, control) for organizations that choose to support/not support nonaffiliated use? Would nonaffiliated use lead to the eventual demise of the traditional office laptop/desktop/phone and also the associated organizational support for these technologies? And, what do these developments imply for future organizational IS infrastructure planning?

From an organizational perspective, as workers upgrade the components of their personal ICT ensembles, their continued desire to use their personal ICTs to improve their quality of life while working will likely lead them to bring new devices and/or new functionality to the workplace (and the associated learning stemming from this). In so doing, they may trigger broader adoption of innovative applications across their organizations as their colleagues recognize positive affordances such new devices or services offer and seek to add them to their own ICT ensembles. Such nonaffiliated use constitutes a new source for ICT innovation in organizations, with new devices and applications being "pulled" into the organization by employees, rather than being "pushed" at employees by the organizational IT function. At the same time, this raises new organizational challenges, as outlined above, to which organizational IT functions will have to respond. IS researchers should examine closely how these debates unfold in organizations over time.

V. CONCLUSION

In this article we proposed a framework to consider the composition and impact of personal ICT ensembles as perceived by the individual.

The article makes the following contributions. First, we indicated how the notion of affordances offers researchers a way to deal with the complexity associated with feature-rich personal information technologies and applications (available via single, highly-integrated platforms, or a variety of different ICTs). Second, in regard to the personal ICT ensembles, we identified different categories of affordances, tied these to associated categories of personal experience satisfaction, and articulated distinct dimensions of contribution to an individual's quality of life. Third, we illustrated how these constructs can be combined into a framework that offers a richer and more comprehensive explanation of personal ICT use that involves multiple contexts (e.g., work, home, leisure) and cross-context influences.

Limitations and Areas for Future Research

We have raised some areas for further research in the preceding sections. To this we add that the framework proposed here should be considered as pre-theory, i.e., a rational set of constructs that await further development and empirical testing. As outlined above, a key limitation is that this is a snapshot model which could be enhanced to accommodate ensemble evolution over time. Another limitation is that the model is framed to be situation- and individual-specific. As such, there will likely be difficulties in dealing with the inherent variation among individuals. Future research could explore ways to address this inherent complexity (e.g., by developing archetypical profiles as is often done in marketing and consumer behavior studies).

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APPENDIX A: ABSTRACTING THE AFFORDANCES OF PERSONAL ICTS

Table A-1: Abstracting the Affordances of Personal ICTs

Affordance category	Description	Examples
Utilitarian	Using personal ICTs as a tool (for effectiveness and efficiency outcomes) (cf. Kim and Han, 2009; Orlikowski and Iacono, 2001)	Recording appointments on a tablet PC Navigating through the city using a GPS-enabled device and traffic congestion service Creating a document using a headset and voice recognition software
Connective	Using personal ICTs as a medium to connect to other individuals, systems or technologies (cf. Golding, 2005)	Making voice calls via a mobile phone Confirming an appointment using SMS Connecting to a work system via a Web browser on a smartphone Purchasing a soft drink from a vending machine using mobile phone credit
Hedonic	Using personal ICTs as a means for entertainment/leisure (cf. Kim and Han, 2009; van der Heijden, 2004)	Playing a game on a portable console Reading a book or newspaper on an e-book reader Listening to music on a portable media player Watching the sports highlights on a high-definition smartphone

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