WORK, HOME, AND TECHNOLOGY: TOWARDS A FRAMEWORK OF IT-BASED BOUNDARY MANAGEMENT

Research Paper

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Abstract

Technology plays a major and ever-increasing role in individuals' efforts to achieve and maintain a balance between work and home. Over the last decade, research investigating the relationship between information technologies (IT) and individuals' boundary management (i.e., tactics or strategies used to manage work and non-work roles) has started to emerge. In the present study, we review the extant literature on this topic and find that it does not represent individuals' practices very well, yet. We identify three central themes that previous research findings can be categorized into and discuss the treatment of the IT-artifact as well as dynamic perspectives in this literature. We then offer a framework of IT-based boundary management. This framework can help illustrate what we know and what we still need to know about the role of technology in individuals' boundary management. It can therefore serve as a foundation for programmatic future research in this area and emphasizes the need for organizational and IS scholars to collaborate on this interdisciplinary topic.

Keywords: Work-Home Balance, Work-to-Home Conflict, Home-to-Work Conflict, Conceptual Framework, Literature Review.

1 Introduction

A good balance between work and home is a highly desirable state for many of us. A lack of balance can entail undesirable consequences such as stress, burnout, reduced life satisfaction, and turnover (e.g., Ahuja et al., 2007; Ferguson et al., 2016; Kossek and Ozeki, 1998; Kreiner, 2006). Needless to say, technologies play a significant role in the ways we try to manage the boundaries between our work and home lives (e.g., Cousins and Robey, 2005; Golden and Geisler, 2007; Kreiner, 2006).

Consider the following examples of how we can utilize technology as tools to manage the boundaries between work and home: by sending a quick text message to a family member while at work, we are able to take influence in the non-work domain despite not being physically present. We can further check our work emails from our beds immediately after waking up, thus engaging psychologically with work topics while being at home. But we might also choose to keep separate email folders; one for work, one for our personal life so that we can actively avoid checking emails that do not belong to the domain we currently want to be involved in. Likewise, we can disable or enable push-notifications of our mobile apps that connect us to work (e.g., enterprise social systems) or home (e.g., social media) to avoid interruptions. We can use two devices, one for work, one for home—or choose to integrate both domains in one device. When going on vacation, we can set up an explicit out-of-office notification to inform our co-workers and bosses that we will not read emails during this time.

Clearly, this list could be continued but, to date, these manifold relationships between technology and individuals' boundary management practices are not well represented in academic research. Given the importance of maintaining a good work-home balance for so many individuals—and the central role of technology in this regard—it is striking how little we know about this topic. We "have little systematic consideration of the role that new information and communication technologies play in this dynamic [individuals' management of work-home boundaries]" (Golden and Geisler, 2007, p. 522). This is an

observation which is much in line with the state of the management literature in general: despite the ubiquity of technology in the world of practice, an appropriate perspective of technology is missing from an overwhelming proportion of organizational theories (Cascio and Montealegre, 2016; Orlikowski and Barley, 2001; Orlikowski and Scott, 2008).

The goal of this study is to find out what we already know and what we still need to know about the relationship between technology and individuals' boundary management practices and boundary-related outcomes. Based on a review of the extant literature in this area, we offer an analysis of major themes that have been studied and propose a framework for research on this topic. Situating prior research within this framework, we can identify what we still need to know about the relationships between technology and individuals' boundary management. Our framework thus contributes by serving as a foundation for consistent and programmatic future research (Webster and Watson, 2002).

Going further, we first define central concepts in boundary-management research which are key to understanding our study. We then report how we conducted our review of the literature. Next, we present the results of our analysis. We finally offer our framework of IT-based boundary management, in which we situate previous studies and discuss where gaps in our knowledge persist.

2   Background on Boundary Management

We refer to *boundary management* as the "tactics or strategies that individuals use to manage work and family roles" (Allen et al., 2014, p. 100). The topic of boundary management is of high academic interest and studies in this area are concerned with the ways in which individuals maintain or transition across boundaries between the work and non-work roles. Boundaries generally "delimit the perimeter and scope of a given domain (e.g., a role, a country, a home, a workplace)" (Kreiner et al., 2009, p. 705) and, specific to boundary management research, the term *boundary* refers to what delineates the scope of a given role (Ashforth et al., 2000). Two theories have become central to boundary management research: boundary theory (Ashforth et al., 2000) and border theory (Clark, 2000). Boundary theory is concerned with individuals' boundary-crossing activities as individuals transition between different roles (Ashforth et al., 2000). Border theory focuses on how relationships between life domains, border characteristics, and border crossing behaviors affect an individual's work-home balance (Clark, 2000). The two theories have different origins but are highly similar in their conceptual nature and the terms boundary and border can be used interchangeably (Allen et al., 2014, p. 103).

An individual's boundaries between work and non-work roles can be characterized along three important dimensions: their flexibility, permeability, and directionality (Ashforth et al., 2000; Hall and Richter, 1988). *Flexibility* describes "the extent to which the physical time and location markers, such as working hours and workplace, may be changed" (Hall and Richter, 1988, p. 215). *Permeability* describes "the degree to which a role allows one to be physically located in the role's domain but psychologically and/or behaviorally involved in another role" (Ashforth et al., 2000, p. 474). These two characteristics are further characterized by their *directionality*. For instance, the family domain may be more or less permeable and/or flexible than the work domain (Allen et al., 2014; Kossek and Ozeki, 1998). Increasingly permeable and flexible boundaries allow boundary blurring/blending—difficulties in distinguishing work and family roles (Allen et al., 2014; Clark, 2000).

Three additional important concepts from boundary management research need to be explained before we can proceed further. First, an individual's *integration and segmentation preference* refers to a continuum that indicates the degree to which the individual prefers that aspects from one domain are kept separate from the other domain (e.g., Allen et al., 2014; Edwards and Rothbard, 2000; Kreiner, 2006). These preferences are different from *their actual enactment*, which refers to the "degree that individuals actually keep work and family domains separate as parts of an active attempt to manage work and non-work roles" (Allen et al., 2014, p. 106). Finally, *work-to-home and/or home-to-work conflicts* arise as consequences of individuals' boundary work. These conflicts are forms of inter-role conflict whereby the demands of one domain interfere with meeting demands of a role in a second domain (e.g., Boswell and Olson-Buchanan, 2007; Edwards and Rothbard, 2000; Kreiner et al., 2009). Actual segmentation of work and life roles is associated with less work-to-home conflict (e.g., Allen et al.,

2014). Note that different labels have been used instead as synonyms of work-to-home (and home-to-work) conflict (e.g., work-life, work-family, work-non-work). In this research, we use the labels work-to-home and home-to-work conflict simply out of personal preference as they do not suggest that work is not a part of life and to further acknowledge the directionality of such conflicts.

3   Methodology

To assess the current state of research on the role of technology in individuals' boundary management practices, we conducted a systematic review of the extant literature (e.g., vom Brocke et al., 2009; Webster and Watson, 2002). The following section provides details on the process we followed that was guided by the research objective stated above. Before we proceed in reporting our study and results, we want to declare that our research is concerned with the individual level of analysis as opposed to an organizational perspective on boundary management which considers organizational policies and practices that should help employees manage different roles (Allen et al., 2014).

The home of boundary management research lies in the organizational behavior literature. To identify the relevant outlets in which boundary management studies are published, we performed an initial search on Google Scholar on the broad topic of boundary management and used a snowball-technique. We further consulted with an expert researcher, whose central research interest is in the field of boundary management, to corroborate and refine the resulting list of journals (i.e., *Academy of Management Journal, Academy of Management Review, Human Relations, Journal of Applied Psychology, Journal of Management, Journal of Occupational & Organizational Psychology, Journal of Occupational Health Psychology, Journal of Organizational Behavior, Journal of Vocational Behavior*). To further include studies that have appeared in IS research, we included all journals contained in the Senior Scholars' Basket of Eight (http://aisnet.org/?SeniorScholarBasket). This final list of journals served as a starting point for our search. Our study is thus limited to the journals included in our initial search as well as those identified through a backward search, excluding conference proceedings. Still, we believe that this list is highly representative of the current literature.

Within these outlets, we conducted a search for relevant keywords that were included in articles' titles, abstracts, and keywords. Based on several iterations, our initial readings, and discussions with experts in research on boundary management, we identified a list of relevant concepts, similar expressions, and synonyms that we translated and merged into a search string. The concepts and their corresponding search terms are displayed in Table 1.

Concepts	Corresponding Search String
Concepts Related to Boundary Management	
Boundary Management, Boundary Theory, Boundary Work, Boundary Crossing, Boundary Control	boundary AND (manag* OR theory OR work* OR cross* OR control)
Role Integration, Role Segmentation, Role Blurring, Role Transition, Role Conflict	role AND (integrat* OR segment* OR blur* OR transition* OR conflict*)
Work-Life, Work-to-Life, Work-Home, Work-to-Home, Work-Family, Work-to-Family	work AND (life OR home OR family)
Segmentation Preference	segment*
Availability	availability
Life Balance	life balance
Concepts Related to Technology	
Technology	technolog*
Information System	information system*
Computer	computer*

Tele-	tele*
Communication	communicat*
Smartphone	smartphone*
Connectivity	connect*
Mobile	mobile

Table 1.   Search Term Components.

We applied the search string to our initial list of journals, not limiting the time period. The results from this step included 601 articles overall. Scrutinizing each of these articles' titles, keywords, and abstracts, we removed those that did not include both aspects central to our research objective (i.e., boundary management or related expressions; technology or related expressions). We further excluded those articles which only used IT personnel or technology industries as a research context but did not, in some way, investigate the relationship between technology and boundary management. This refinement resulted in an exclusion of 571 articles, leaving a total of 30 relevant articles.

The remaining articles were read in full. As a result, another 13 articles were removed from the sample as they investigated telecommuting (i.e., working from home—no specification as to how technology is involved) without considering any concept representing technology, since individuals may engage in job-related tasks outside of work without the use of technology (e.g., Boswell and Olson-Buchanan, 2007). We further conducted a backward search by screening the references of the remaining studies for relevant and peer-reviewed research, which led to the addition of another 11 articles.

4   Results

In this section we report the findings of the literature review. After providing an overview of the characteristics of the studies reviewed, we report the three major themes that emerged. We discuss the treatment of the IT artifact afterwards and then provide a temporal perspective on the studies.

Table 2 provides an overview of the sample characteristics in chronological order of the studies. Overall, the sample consists of 28 articles. Most of them rely on cross-sectional data; some, mostly qualitative studies, have used longitudinal data. Newer research is based on diary studies, emphasizing the importance of differentiating between days or events of different quality. The majority of studies has been published within the last decade and is based on data obtained from Western cultures.

Article	Method | Data[a] | Sample	Technology[b]	Most Relevant Concepts	Theme[c]	Overarching Framework
Duxbury et al. (1992)	Survey | C | N = 504 (Canada)	PCs	After-hours telecommuting, role overload, family-work-spillover, work-family spillover	O	No overarching framework
Fenner and Renn (2004)	Conceptual | - | -	Personal and handheld computers, mobile phones, or pagers	Organizational climate, personal innovativeness, job involvement, conscientiousness, career commitment, perceived usefulness, technology satisfaction, technology-assisted supplemental work, work-to-family conflict, media richness, time-management skills, boundary-management skills	A/O	No overarching framework
Chesley (2005)	Survey | L | N = 1,367 (US)	Computers (email, Internet), communication technology (mobile phones, pagers)	Technology use, individual distress, family satisfaction, work-family spillover, family-work spillover	O	Boundary theory
Cousins and Robey (2005)	Case study | L | N = 4 (US)	Laptops, wireless modems, mobile phones, PDAs	Patterns of technology use, time, space, social context, effectiveness	P	Theory of human agency

Jarvenpaa and Lang (2005)	Focus groups | C | N = 222 (Finland, Japan, China, US)	Mobile technology (mobile phones, PDAs, BlackBerries)	Technology paradoxes, purposes of technology use, coping strategies, situational factors	A/O/P	No overarching framework
Middleton and Cukier (2006)	In-depth interviews | C | N = 13 (Canada)	BlackBerries	Danger, anti-social behavior, distraction, infringement, functional usage, dysfunctional usage	O	Two-level perspective on technology adoption, Metaphor of psychic prison
Olson-Buchanan and Boswell (2006)	Survey | C | N = 360	Communication technologies	Role identification, boundary permeability, role referencing, interruptions, boundary creation, work-to-life conflict	A/O/P	Boundary theory
Prasopoulou et al. (2006)	In-depth interviews | C | N = 15	Mobile phones	Sequence, duration, temporal location, rate of sequence, socio-temporal order	A	Socio-temporal order
Towers et al. (2006)	Survey/interviews | C | N = 845/61 (Canada)	Work extending technologies (BlackBerries, mobile phones, PDAs, PCs, laptops)	Work extending technology use, benefits and drawbacks of work-extending technology, (in)appropriate use, strategies for effective use	A/O	No particular overarching theory
Boswell and Olson-Buchanan (2007)	Survey | C | N = 360	Communication technologies (mobile phones, email, voice mail, PDAs, pagers)	Technology use after hours, affective commitment, job involvement, ambition, work-to-life conflict	A/O	Boundary theory
Golden and Geisler (2007)	In-depth interviews | C | N = 42 (US)	PDAs	Interpretative repertoires, discursive moves, PDA use practices, forms of boundary management	O/P	Adaptive structuration theory, duality of structure
Wajcman et al. (2008)	Survey | C | N = 1358 (Australia)	Mobile phones	Mobile phone use, work-to-family spillover, family-to-work spillover	O	No particular overarching theory
Kreiner et al. (2009)	In-depth interviews | C |N = 60 (US)	Not specified	Boundary preferences, boundary work tactics, boundary violations, work-home conflict	O/P	Boundary theory
Fenner and Renn (2010)	Survey | C | N = 227 (US)	Mobile phones, pagers, BlackBerries, computers	Organizational climate, perceived usefulness, technology-assisted supplemental work, time-management skills, work-to-family conflict	A/O	Technology acceptance model
Ayyagari et al. (2011)	Survey | C | N = 661 (US)	Mobile-, network-, communication-, enterprise-, database-, -generic application-, collaborative-, other technologies	Technology presenteeism, work-home conflict	O	Person-environment-fit
Barley et al. (2011)	Mixed-methods | C/D | N = 79	Email	Availability expectations, technology use, work-to-home conflict, materialities of email	A/O	No particular overarching theory
Hislop and Axtell (2011)	Case study | C | N = 17 (UK)	Mobile phones	Work-related communication patterns	A/P	Boundary theory
Park et al. (2011)	Survey | C | N = 269 (US)	Technology (PDAs, mobile Internet, emails, smartphones, computers)	Technology use, segmentation preferences, segmentation norm, detachment from work	A/O	No particular overarching theory
Diaz et al. (2012)	Survey | C | N = 193 (US)	Communication technologies (cell phones, email, and other forms of electronic communication)	technology flexibility, technology use, work satisfaction, work-to-life conflict	A/O	No particular overarching theory
Sarker et al. (2012)	In-depth interviews | C | N = 21 (US, India, Denmark, Korea, Finland)	Mobile technologies	availability expectations, technology use patterns, work-life balance, strategies to address work-life balance issues	A/O/P	No particular overarching theory

Mazmanian (2013)	Ethnographic study | L | N = 57 (US)	BlackBerries	frames of reference, technology use, shared assumptions	A/O	Technological frames of reference
Mazmanian et al. (2013)	In-depth interviews | L | N = 48	Mobile email devices	availability expectations, technology use patterns, professional norms, materialities of mobile email	A/O	No particular overarching theory
Derks et al. (2014)	Diary study | D | N = 70 (Germany)	Smartphones	smartphone use, segmentation norm, detachment from work, exhaustion	O	No particular overarching theory
Dery et al. (2014)	Case study | L | N = 14 (US)	Smartphones	availability expectations, affordances of mobile email devices, boundary management	A/P	No particular overarching theory
Butts et al. (2015)	Diary study | D | N = 341	Communication technologies	electronic communication: affective tone/time required, abusive supervision, communication sender, segmentation preferences, anger, happiness, work-to-nonwork conflict	O	Affective events theory
Derks et al. (2015)	Diary study | D | N = 100 (Netherlands)	Smartphones	smartphone use, work engagement, expectations, work-home interference	O	Boundary theory
Derks et al. (2016)	Diary study | D | N = 71 (Netherlands)	Smartphones	smartphone use, segmentation preference, work-family conflict	O	Boundary theory
Ferguson et al. (2016)	Survey | C | N = 688 (US)	Mobile devices (smartphones or tablets with Internet access)	technology use, work-to-family conflict	O	Conservation of resources
[a]: C = cross-sectional data; L = longitudinal data; D = diary/event-based data; [b]: as specified by the authors; [c]: A/O/P: study includes results with respect to (A): antecedents of boundary-affecting technology use, (O): technology use and boundary-related outcomes, (P): patterns of active technology-based boundary management.					

Table 2.   Overview of the Studies Reviewed.

4.1   Themes of Relationships Studied in the Literature

In this subsection, we provide an overview of the reviewed studies' findings, identifying three central themes of research, each considering a different angle on the role of technology in individuals' boundary management practices and boundary-related outcomes. Please note that one article could tackle one or more themes at once.

4.1.1   Technology Use and Boundary-Related Outcomes

The first theme subsumes those articles that demonstrate how individuals' technology use leads to boundary-related outcomes such as work-to-home conflict or spillovers from one domain into another. This theme is also the one that is covered by the most articles in the sample by far. The most dominant finding of these papers is that the extent of work-related technology use, especially outside of temporal and spatial work boundaries, entails several negative boundary-related outcomes such as work-to-home conflict (e.g., Boswell and Olson-Buchanan, 2007; Derks et al., 2015; Duxbury et al., 1992; Ferguson et al., 2016; Middleton and Cukier, 2006).

Some interesting aspects can be noted from reviewing these articles. First, several of these studies have identified potential moderators of the link between work-related technology use and its associated outcomes. For instance, Fenner and Renn (2004) argue conceptually that an individual's boundary management skills and time management skills should weaken the effect of technology use on work-to-home conflict. In a subsequent empirical study, they test and find a moderating effect of time (but not boundary) management skills on this relationship (Fenner and Renn, 2010). Chesley (2005) finds gender differences for the link between communication technology use and negative home-to-work spillover effects. A puzzling finding results from a study by Derks et al. (2016) who find that, for employees with an integration preference, smartphone use led to reduced work-to-home conflict but they found no significant relationship between smartphone use and work-to-home conflict for those with a segmentation preference. A study by Butts et al. (2015) offers related findings which are somewhat

inconsistent with Derks et al. (2016), observing that segmentation preference could increase the effect of technology use on work-to-home conflict. Others have found moderating effects of segmentation norms on the link between work-related smartphone use and psychological detachment from work (Derks et al., 2014) or work-to-home interference (Derks et al., 2015).

Second, the vast majority of studies looks at concepts representing some kind of work-to-home conflict. But, as mentioned earlier, boundaries are directional in nature and, thus, work-to-home conflict needs to be distinguished from home-to-work conflict. Studies that consider the home-to-work direction offer mixed results. Duxbury et al. (1992) find no significant relationship between technology use for work after regular office hours and home-to-work conflict. Coming to a different conclusion, Wajcman et al. (2008) find a significant relationship between an individual's extent of mobile phone use and home-to-work spillover effects. Moreover, Chesley (2005) finds that communication technology use causes negative home-to-work spillovers for women but not for men.

Third, a small proportion of studies has used episodic or event-based sampling approaches based on diary data. These studies acknowledge that boundary work and boundary-related conflicts are situational in nature and can thus vary within individuals. Work conducted by Derks et al. (2014; 2015; 2016) demonstrates that daily variations in technology use entail respective variations in boundary-related outcomes. For instance, Derks et al. (2016) show that smartphone use after regular work hours on a specific day can increase daily work-to-home conflict. In a similar vein, Butts et al. (2015) show that not only the mere quantity of technology use might determine associated outcomes but also the quality of events. In their diary study, the authors show that each communication event possesses unique characteristics that determine the extent of negative or positive effects on employees. In particular, affective tone of and time required for an electronic communication event led to either anger and/or happiness, which were in turn associated with work-to-home conflicts.

4.1.2 Antecedents of Boundary-Affecting Technology Use

Studies related to this second theme provide insights regarding the antecedents of boundary-affecting technology use—technology use which either intentionally or unintentionally contributes to cross-boundary effects. These antecedents can be categorized into three major categories.

First, and by far the most commonly found antecedents are social norms and expectations held by others about an individuals' availability via certain technology channels. For instance, Mazmanian et al. (2013) find that shared assumptions about the use of mobile email technology can lead to continual checking of such devices which might then alter professional norms about the use of such technology in general. Interestingly, such expectations about others' availability can differ between work groups even to the point of shared assumptions of heterogeneity in how others use mobile email devices. In this case of congruent frames of heterogeneous communication practices, communication norms can develop that circumvent the trap of constant connectivity (Mazmanian, 2013). In contrast, homogenous expectations of constant availability can lead to increased technology use and associated work-to-home conflicts (e.g., Barley et al., 2011; Fenner and Renn, 2010; Mazmanian, 2013; Prasopoulou et al., 2006; Sarker et al., 2012). Such norms and expectations make it difficult for individuals with certain preferences to actively enact choices of not being available to others (Dery et al., 2014).

Second, some studies consider individual attitudes and preferences as antecedents of boundary-affecting technology use. Boswell and Olson-Buchanan (2007) find that individuals' work attitudes, specifically their ambition and job involvement, positively affect individuals' amount of communication technology use after hours. In a similar vein, Hislop and Axtell (2011) study mobile phone use among professionals without managerial responsibility and find that these individuals simply switch off their phones after work and thus have less issues with work intruding upon non-work time through their technology use. Park et al. (2011) find that individuals' technology use at home for work is affected by the users' segmentation preferences.

Third, a few studies point to potential technology characteristics which somehow contribute to individuals' boundary-affecting technology use. It is interesting to note that these studies are all based on qualitative data and that they identify certain technology characteristics in a rather inductive (instead

of deductive) manner. Studies of mobile device users find that these devices' accessibility and instant communication capabilities contribute to increased work-related use (Mazmanian, 2013; Mazmanian et al., 2013; Prasopoulou et al., 2006). In addition, Mazmanian (2013) observes that symbolic aspects of BlackBerry devices can contribute to behaviors of constant availability. Barley et al. (2011) note that emails' asynchronous nature contributes to increased email use, as it allows emails to accumulate until processed and creates fears of falling behind in one's work and missing important information.

4.1.3   Patterns of Active Technology-Based Boundary Management

The third theme of studies has received the least attention in previous research and considers patterns of active technology-based boundary management behaviors by individuals. As opposed to many other studies we have reviewed, studies belonging to this third category assume that technology users are active agents who seek to enact their boundary-related preferences in social contexts by using technology in different ways. Only three studies focus explicitly on this topic (Cousins and Robey, 2005; Dery et al., 2014; Golden and Geisler, 2007) while others report findings supporting this view, although more as a side note. Interestingly, except for one study (Olson-Buchanan and Boswell, 2006), studies related to this third theme are all qualitative in nature.

In a study of nomadic computing environments, Cousins and Robey (2005) focus on how nomadic computing workers manage boundaries between business and personal activities through patterns of technology use. The authors emphasize the role of human agency and take a more practice-oriented perspective that considers people to enact technology's features in ways that satisfy their particular needs and interests, directing attention away from structures embodied in technologies (e.g., Orlikowski, 1992). The authors find that the individuals they studied have different integration/segmentation preferences and actually enact these preferences by means of using and adapting technologies (e.g., integrating work and personal devices, avoiding wireless hotspots to avoid boundary blurring, dedicating devices to certain tasks). In a similar vein, Golden and Geisler (2007) study how individuals make different use of personal digital assistants (PDAs) as an instrument of managing the work-home boundary according to their individual preferences. They identify different practices in using PDAs that serve different boundary management objectives such as containing work, integrating work and private, transitioning work across boundaries, and protecting the private life. Dery et al. (2014) investigate how smartphone users exercise agency to connect and disconnect with work. They find that individuals separate and switch between work and non-work devices to segment work and home by fluidly connecting and disconnecting with work.

As mentioned, other studies touch upon this theme more as an aside and in a much less detailed fashion, but support the role of users as active agents that interact with technology. In a study about paradoxes of mobile technologies, Jarvenpaa and Lang (2005) report individuals' desires for technology features that help them to enact their integration/segmentation preferences. Hislop and Axtell (2011) find that non-managerial employees are able to simply switch off and not use their mobile phones after work or use call filtering to avoid work-to-home conflicts. In a similar vein, Sarker et al. (2012) report that their participants also disabled certain functions of their mobile devices (e.g., turning off emails) after work hours to avoid using them and causing spillovers in undesired situations. Kreiner et al. (2009) find that individuals engage in boundary work to resolve differences between their work-home boundary preferences and the actual situation. This involves active management of technology to segment and/or integrate work and home. For instance, the authors reported their participants to use multiple email accounts to segment professional and personal emails. The only quantitative study that relates to this theme finds that individual who seek to integrate their work and private life set fewer boundaries for technology use outside work hours (Olson-Buchanan and Boswell, 2006).

4.2   The Role of IT

Our review of the literature confirms what has been observed with respect to the organizational literature in general, namely that the role of technology has been treated in a rather superficial way by the majority of studies (Orlikowski and Barley, 2001; Orlikowski and Scott, 2008). In sum, the majority

of studies we have reviewed conceptualizes technology abstractly (not differentiating between technologies, their different features and unique characteristics) and treats it deterministically while overlooking the role of human agency in shaping technology use and its outcomes. This presents a problematic finding given that technologies, individual users, and social contexts differ, and therefore different outcomes can result (Cousins and Robey, 2005; Golden and Geisler, 2007; Mazmanian, 2013).

The largest (but not necessarily oldest) proportion of studies do not have an IS background but are situated in the organizational behavior and human resources literature (e.g., Boswell and Olson-Buchanan, 2007; Butts et al., 2015; Derks et al., 2016; Derks et al., 2015; Derks et al., 2014; Fenner and Renn, 2004; Fenner and Renn, 2010; Kreiner et al., 2009). These studies have focused on a specific technology or group of technologies (e.g., "communication technologies") without specifying the characteristics of these technologies that contribute to use and boundary-related outcomes. For instance, studies investigating smartphone use do not specify how smartphones are used and what features are of interest (e.g., Derks et al., 2016; Derks et al., 2015; Derks et al., 2014). Obviously, a single smartphone affords users to install different applications, each with different purposes and characteristics. Other studies consider participants' technology in general, subsuming very different technologies under one umbrella without differentiating or discussing why such a subsumption is valid (e.g., Butts et al., 2015; Park et al., 2011; Towers et al., 2006). From an IS perspective, it is problematic that these studies usually do not discuss how the particular study's technology context influenced the results. Furthermore, with a few exceptions, this large proportion of studies investigates how individuals' mere intensity of technology use blurs the boundaries between work and home without considering individuals as active agents.

The smaller proportion of studies does consider specific technology characteristics or discusses how certain material aspects play a role in contributing to users' behaviors and outcomes (e.g., Barley et al., 2010; Cousins and Robey, 2005; Golden and Geisler, 2007; Mazmanian, 2013; Mazmanian et al., 2013). These studies usually reject a deterministic view of technology but consider an active interplay between human agency and material aspects of technology. A high level result from these studies with regard to the relationship between technology and boundary management is that people enact their own preferences and social expectations to actively manage the boundaries between work and home. For instance, the study conducted by Cousins and Robey (2005) finds that professionals use and adapt material aspects of technology according to their integration/segmentation preferences to achieve a preferred level of work-home balance. While one of their participants decided to integrate work and personal devices and synchronize data among them, others avoids using hotspots to connect to the Internet to avoid boundary blurring or mixes company and personal email folders to better integrate different life domains. Similarly, Golden and Geisler (2007) investigate individuals' use of PDAs as an instrument of boundary management. They identify different practices in using PDAs that serve different boundary management objectives such as containing work or integrating work and private. They emphasize that work-home boundary management is not an affordance with which the technology was "inscribed" by its developers but that the participants adapted these devices in practice and constructed the technology as a tool as part of their boundary management efforts. It needs to be noted that enacting choice is often difficult due to social norms and expectations which can lead to negative boundary-related consequences unintended by the individual users (Dery et al., 2014; Mazmanian et al., 2013).

4.3   Change over Time

Only few of the reviewed studies (mostly newer ones) are based on longitudinal data allowing detailed insights into potential changes over time. Some of these studies are quantitative in nature and have acquired daily or event-based data on individuals' technology use and outcomes (Butts et al., 2015; Derks et al., 2016; Derks et al., 2015; Derks et al., 2014). These studies demonstrate that boundary-related outcomes of technology use are subject to intra-individual variations. Butts et al. (2015) show that communication events differ in their affective quality which in turn affects the quality of work-to-home conflict. Studies by Derks et al. (2014; 2015; 2016) show that the extent of work-to-home conflict varies between days.

The few qualitative studies based on longitudinal data offer additional interesting insights (Cousins and Robey, 2005; Dery et al., 2014; Mazmanian, 2013; Mazmanian et al., 2013). Cousins and Robey (2005) use longitudinal data to study why users' patterns of technology use change over time. They find that individuals' interpretations of technologies' effectiveness can change over time, which entails changes in how these individuals enact their boundary-related preferences. Such changes in interpretations of technologies are also reported in Mazmanian's (2013) study of two groups of BlackBerry users in a single organization. Mazmanian investigates the emergent interweaving of material properties of technologies with evolving social norms and expectations and finds that developing norms can lead to congruent frames of either homogeneous or heterogeneous communication practices, which in turn affect constant connectivity behaviors among group members. In case that congruent fames of homogeneous communication practices evolve among group members, this can lead the group into a trap of constant connectivity in which BlackBerry use can escalate and allows intrusions of the work domain into the non-work domain. Mazmanian et al. (2013) report a similar finding. In their study of autonomy among knowledge professionals, they find that, due to patterns of constant connectivity, shared assumptions and expectations of availability evolve over time, which intensifies mobile email use and work-to-home conflicts. This theme of change in technology experiences and expectations over time is further emphasized by a study of smartphone use conducted by Dery et al. (2014) who report increasing expectations of employees' connectivity both during as well as outside work.

5   Discussion

5.1   Towards an IT-Based Boundary Management Framework

We now offer a framework of IT-based boundary management that is guided by existing perspectives on the role of IT in individuals' behaviors as well as the general boundary management literature. This framework can be used to summarize what we know about the relationships between technology and boundary management. Moreover, it helps demonstrate where we still lack knowledge, highlighting discrepancies between what we know and what we need to know (Webster and Watson, 2002). Figure 1 shows the framework, which centers around the umbrella concept of IT-based boundary management. Based on the definition of boundary management in general (Allen et al., 2014), we define IT-based boundary management as an individual's tactics or strategies to manage work and family roles through the use of IT. IT-based boundary management subsumes individuals' active behaviors involving IT such as those reported in the prior literature that affect boundary-related outcomes in some way (e.g., different types of IT use, adaptation, other ways to enact preferences).

With respect to antecedents of IT-based boundary management, the framework considers different context-dependent factors related to technology, the organizational environment, and the individual. We assume that these factors jointly interact to shape different forms of an individual's IT-based boundary management (arrows 1–3). This assumption is based on the general perspective that the ways in which individuals use technology are neither purely determined by technology itself nor are they a mere result of human agency or environmental factors (e.g., DeSanctis and Poole, 1994; Leonardi, 2011). The assumption also aligns with boundary management research outside a technology context, which states that individual preferences but also "supplies" (i.e., workplace conditions and resources) affect individuals' boundary management behavior (Kreiner, 2006). The studies in our literature review support this view as they collectively suggest that no factor strictly determines behavioral outcomes across individuals, environments, and technologies (e.g., Boswell and Olson-Buchanan, 2007; Hislop and Axtell, 2011; Mazmanian, 2013).

Regarding the consequences of IT-based boundary management, our framework is based on the rich findings in prior research that individuals' technology use behaviors somehow affect boundary-related outcomes (e.g., Derks et al., 2015; Duxbury et al., 1992; Ferguson et al., 2016). In addition to a direct link between IT-based boundary management and boundary-related outcomes (arrow 4), the framework further includes different boundary characteristics (permeability, flexibility, directionality)

which are affected by individuals' boundary management behaviors and subsequently affect bounda-ry-related outcomes (arrows 5 and 6; e.g., Boswell and Olson-Buchanan, 2007; Derks et al., 2016).
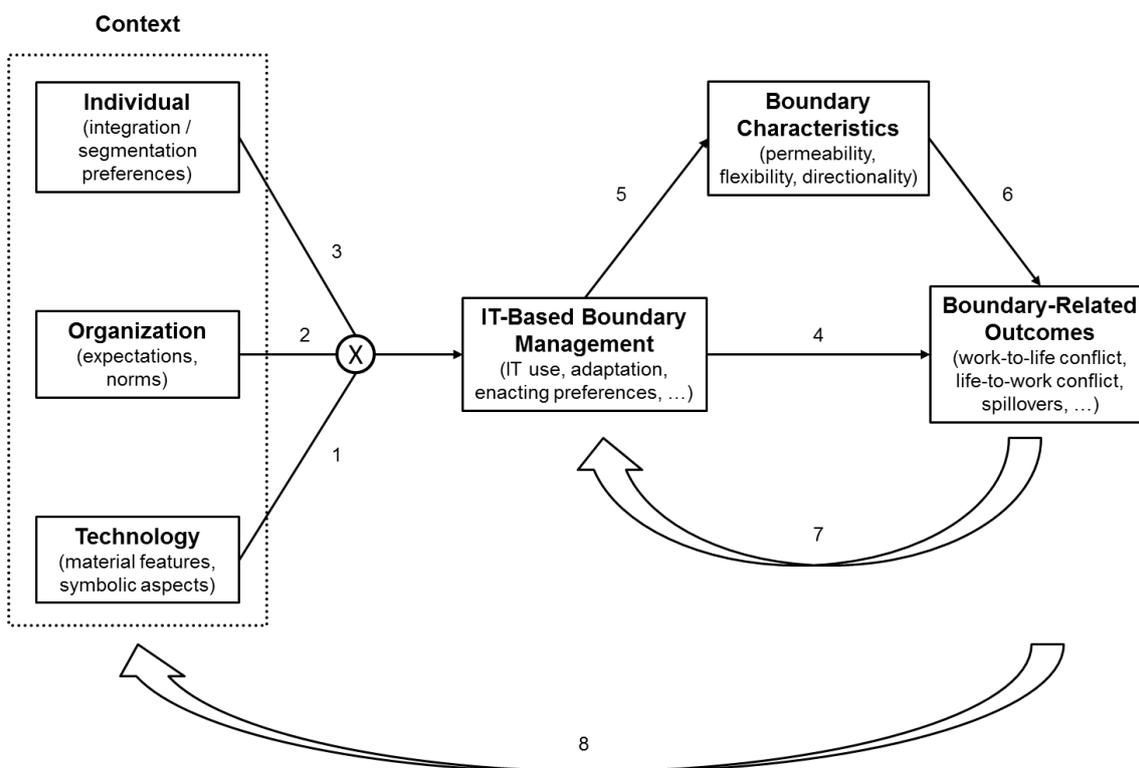

Figure 1.   Framework of IT-Based Boundary Management

Finally, the framework includes feedback loops (arrows 7 and 8) which symbolize the dynamic nature of boundary work. In her seminal work on boundary theory, Nippert-Eng (1996), p. 7) notes that: "through everyday choices and practices, we each continually work toward some level of integration/segmentation, enacting, reinforcing, and modifying our ideas of what is 'work' and 'home' and how they should relate." Thus, IT-based boundary management should not constitute a one-time event but more of a constant process that includes feedback on behaviors and contextual factors.

5.2   Avenues for Future Research

We can situate the themes of existing research reported in the previous section in this framework to answer the question what we still need to know about IT-based boundary management. Table 3 contains some exemplary research questions that can be derived from this framework, as illustrated below.

First and foremost, in the majority of studies we have reviewed, IT-based boundary management was manifested as simple IT use. Clearly, IT use is a very broad concept and it is easy to imagine that different ways of using IT exist with their own particular antecedents and outcomes. The few studies belonging to the third theme (see section 4.1.3) offer promising insights into this largely neglected perspective: how individuals actively try to manage boundaries based on the possibilities afforded by technology. These studies align with the idea that individuals actively engage in integration or segmentation (Edwards and Rothbard, 2000), regarding individuals as human agents who enact technology's features in ways that satisfy their individual needs. An important first step for future research is to distinguish different manifestations of IT-based boundary management. Based on theories of IT (e.g., DeSanctis and Poole, 1994; Leonardi, 2011; Venkatesh et al., 2003) combined with research on boundary management (e.g., Ashforth et al., 2000; Clark, 2000), scholars could develop typologies/taxonomies of IT-based boundary management to better understand what different types of IT-

based boundary management are used by individuals. Furthermore, an interesting question is how individuals adapt and/or reinvent technologies to meet their own boundary-related preferences and others' expectations (e.g., Nevo et al., 2016). The study by Golden and Geisler (2007) indicates that individuals use technologies in ways which might not have been envisioned by their designers. Instead, individuals might tailor technologies to fit their own specific needs as part of their IT-based boundary management practices.

Potential Research Questions
What are different types of IT-based boundary management?
How do individuals adapt or reinvent technologies to meet their own boundary-related preferences or others' expectations in this regard?
How are different types of IT-based boundary management enabled by different affordances of technology?
How do certain work-related characteristics and certain types of IT-based boundary management relate?
How do types of IT-based boundary management change if individual/organizational/technological factors change at one point in time and disrupt established routines?
How do certain types of IT-based boundary management affect different boundary-related outcomes, especially those neglected in prior research?
How do boundary characteristics mediate the link between certain types of IT-based boundary management and boundary-related outcomes?
Can a more differentiated understanding of IT-based boundary management explain the inconsistent results of prior research that has investigated the relationship between technology use and home-to-work conflict?
How do different boundary-related outcomes lead to changes in individuals' IT-based boundary management over time?
How do different boundary-related outcomes lead to changes in individuals' beliefs or attitudes, the organizational environment, or material features of technology over time?

Table 3.   Exemplary Research Questions.

Studies subsumed under the second theme have investigated antecedents of boundary-affecting IT use. Examined relationships include the link between norms and expectations as well as individual preferences and IT use (arrows 2 and 3). But again, IT-based boundary management involves more than simple IT use. Contextual factors (i.e., organizational, individual, technological) can shape other IT-based boundary management behaviors as demonstrated by Cousins and Robey (2005). The few studies that consider the relationship between technology characteristics and individuals' technology use (arrow 1) provide important insights regarding the role of material and symbolic aspects of technology which need to be taken into consideration when studying other parts of the framework to avoid treating different technologies in an overgeneralizing manner. Clearly, more research is needed to increase our understanding how particular characteristics of technologies interact with other contextual factors to contribute to individuals' IT-based boundary-management behaviors and related outcomes. Again, theoretical perspectives on IT that acknowledge interactions between contextual factors in shaping individual outcomes could serve as a starting point in this regard (e.g., DeSanctis and Poole, 1994; Leonardi, 2011). Potential research questions could revolve around the different affordances of IT that enable certain IT-based boundary management behaviors. Another particularly interesting avenue for future research could be to take a closer look at the organizational context such as the nature of work that is involved in certain types of IT-based boundary management. What are possible patterns of work-related characteristics and certain types of IT-based boundary management? Moreover, what happens to IT-based boundary management behaviors and boundary-related outcomes if important contextual factors change at one point in time and disrupt established patterns of technology use? Organizations could employ new practices and policies such as a right to disconnect (e.g., BBC, 2016). Likewise, individual preferences could change due to major life changes such as becoming parents,

moving abroad, or being promoted. In a similar manner, the technological context will keep on changing in the future which will alter technologies' affordances to different individuals.

Studies subsumed under theme 1 have considered the relationship between IT use (a subset of IT-based boundary management behaviors) and boundary-related outcomes. But research in this area has only considered a small subset of the potential relationships (a subset of arrow 4). Most research related to this theme has investigated the negative consequences of technology use outside of working hours (Hislop and Axtell, 2011). The boundary-related outcome most frequently investigated in prior work is work-to-home conflict while the sparse research on home-to-work conflict has produced inconsistent results. Further, the role of boundary characteristics in this relationship (arrows 5 and 6) that is established in the general boundary management literature has been neglected by the reviewed literature. But boundary management actually aims at shaping the boundaries with regard to different dimensions (i.e., flexibility, permeability, directionality). Boundary management behaviors can make boundaries between work and home more permeable and flexible which then enables certain boundary-related outcomes to occur (e.g., Boswell and Olson-Buchanan, 2007; Derks et al., 2016). It is easy to imagine that different IT-based boundary management practices involve changes in different boundary characteristics—a perspective mostly neglected by prior research so far. Thus, based on a more differentiated understanding of different types of IT-based boundary management, a logical next step could be to investigate these different types' effects on boundary-related outcomes based on theoretical perspectives such as boundary theory (e.g., Ashforth et al., 2000), border theory (e.g., Clark, 2000), or research on recovery (e.g., Sonnentag, 2003). A clearer understanding of different types of IT-based boundary management might help to resolve inconsistent findings in prior research with respect to the home-to-work direction, as reported above. Similarly, since prior research has mostly focused on negative outcomes of individuals' technology use, future research could investigate how different types of IT-based boundary management might lead to positive spillovers.

Finally, as argued above, boundary management is not actually a one-time event that occurs at a particular point in time and space. Rather, individuals hold concurrent and conflicting goals and therefore have to constantly engage in balancing acts between different life domains and therefore engage in continual boundary work to achieve and maintain balance (Golden and Geisler, 2007; Kreiner et al., 2009; Nippert-Eng, 1996). This dynamic nature of IT-based boundary management is hardly represented by the research we have reviewed. But neither boundary management, nor boundary characteristics or boundary-related outcomes are static concepts. They may very well vary across episodes, situations, and contexts (Butts et al., 2015; Derks et al., 2016; Nippert-Eng,1996). Individuals can decide on a situational basis whether to take a phone call, answer an email from home, or switch off the smartphone after work (e.g., Chesley, 2005; Hislop and Axtell, 2011). Accordingly, research that takes the dynamic situational nature of boundary management into account (all arrows in the framework) or considers feedback loops (arrows 7 and 8) such as Mazmanian et al. (2013) is highly needed. Potential research questions along these lines could be concerned with changes in IT-based boundary management activities, individuals' preferences, organizational expectations, and material features of technology, which are triggered by preceding boundary-related outcomes.

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