# Interferences Between Work and NonWork In the Context of Smartwork: The Role of Boundary Strength and Autonomy

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**A B S T R A C T**

With the advances of information technologies, the interest in SmartWork including extended version of telework and flexible work are increasing, and various types of SmartWork attempted to make working time and place flexible with the goal of work and life balance. Despite its emphasis on work and life balance, SmartWork is expected to make the boundaries between work and nonwork blur and role conflicts occur more than before, and thus the goal of work and life balance becomes more distant. A number of SmartWork users are significantly increasing in Korea, but little is known concerning the antecedents and mechanisms to explain psychological work and interferences in the SmartWork environment. In this paper, using boundary theory, we empirically investigate factors affecting the interferences at both work and nonwork domains. The results, based on data collected from SmartWork users in one of the biggest telecommunication companies in Korea where SmartWork is adopted and extensively used, suggest the factors may be affecting differently interferences at the work and nonwork domains.

*Keywords:* SmartWork, Interference, Boundary Strength, Job Autonomy, Permeability, Identification

## Ⅰ. Introduction

Recent technological advances extend workplace boundaries beyond the constraints of physical space has brought profound changes to ways for the work and nonwork domains[1] to interact. Thus a new work-ing environment is thought to be emerging that is not constrained by the former limits of linear time and separable space (Kaufman-Scarborough, 2006). Alternative work environments such as SmartWork – working efficiently and conveniently regardless of time and place utilizing information and commu-

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nication technologies (ICTs) allows employees to perform tasks elsewhere, thus allowing work to enter the nonwork domain, and distinctions between work and nonwork time are becoming blurred. Being constantly available for both work and family through technologies make individuals feel as if they are always on call, breeding work and family interference (e.g., reference omitted intendedly; Chesley, 2005). On the other hand, others also argue that technological uses have the potential to support SmartWork arrangements that enhance flexibility and control, thereby increasing productivity (Valcour and Hunter, 2005).

Korean government has pushed for SmartWork, pursuing an objective of 'work and life balance with a change of work style' since 2010. Various types of SmartWork such as SmartWorking centers, mobile work, flexible time working, and home based work were being attempted to improve work and life balance (Oh et al., 2014). SmartWork in Korea is not a new form of work (Vitola, 2013), but is an advanced form of ICT-enabled work such as telecommuting (Nilles et al., 1974) and distance work (Olson, 1982) in the 70s and recently appearing e-work, telework, virtual work, flexible work, home-office work, and distributed work (Golden and Fromen, 2011). In ICT-enabled work from telecommuting to SmartWork, there is something in common in organizations that

they have tried to seek work and life balance through new ways of working to ease the constraints of time and space.

Ongoing development of ICTs and the increasing importance of work and life balance has contributed to SmartWork entering many organizations in Korea. The Korean government as well as Korean companies are showing greater interest in "SmartWork". According to the Korea Communications Commission (2011), 136 out of 1,794 major companies (7.7%) in Korea and the Korean government are planning to implement SmartWork environments by 2015 so that 30% of the whole labor work force is able to work efficiently regardless of time and place. According the 2017 Smart Work Research Report (Yoon et al., 2017), allowing duplicate responses, showed that the workers are using mobile office (32.0%), flexible work (25.0%), telework (24.9%), and SmartWork center (19.5%). The increase in the popularity of SmartWork has paralleled profound trends of urbanization, climate change, and innovation at the beginning of the 21st century, with increasing demands on skilled workers for work flexibility and better work and life balance. A better work and life balance can make room for creativity, thus enhancing work concentration and accomplishments by using time and space effectively as well as earning private time for their family and self-development (Tremblay, 2002).

As the SmartWork environment makes it possible to work and/or enjoy personal lives anytime and anywhere beyond time and place constraints, research on blurring boundaries between work and nonwork is growing attraction for attention. Basically, SmartWork users have to rely on their own boundary management to reconcile the relative demands of work and nonwork since the nature of the job environment does not provide clear time and space distinction. Positive and negative appraisals coexist

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1) Nonwork domain includes a broad range of domains such as family, personal life, and community. Work means paid work, while nonwork does unpaid work such as family care, leisure, and hobbies. The term nonwork is equivalent to "life" from "work-life." (Chen, 2018). Since the nonwork domain includes a variety of activities, there are limitations to comprehensively address roles in the nonwork domain. Family-received activities had the meaning of a role in responding to work until the role was subdivided in the nonwork area, and are still a central role in the nonwork area, so this study attempts to compare the nonwork domain with the work domain centered on the family role. In this paper, work-family, work-life, work-personal life will be used interchangeably.

to the blurred boundaries between work and nonwork (Valcour and Hunter, 2005). From the positive perspective, it is emphasized that workers are able to flexibly control their work as well as nonwork and their potential is fully utilized. Therefore, SmartWork helps workers to accommodate demands of both domains and enhances their work and life balance. As opposed to the positive perspective, workers may experience interferences and they cannot focus neither on work or family. Such interference between work and family has been linked with undesirable outcomes such as job and life dissatisfaction, absenteeism and turnover (Cardenas et al., 2004; van Steenbergen et al., 2007) and greater feelings of physical exhaustion and negative emotions (Kreiner et al., 2009).

Work and life is one of the hottest issues in management research (Kreiner, 2006). Meaning, the reduction of work/nonwork interference (Clark, 2000) and role conflicts between work and nonwork (Frone, 2003). Work and life balance is related with the activities which lessen interferences. Previous research on work and life balance mainly focused on workers' passive acceptance of interferences rather than active management of themselves. Whether they are benefits or harms, workers are assumed to passively accept interferences (Greenhaus and Beutell, 1985). As a result, interferences are treated as provoking psychological problems, and directed one way from work to nonwork (Jacobs and Gerson, 2004). However, workers can also actively manage boundaries to enhance work and life balance.

In the context of SmartWork, despite its emphasis on work and life balance, the literature in the past few years has recognized that it is expected that the boundaries between work and nonwork blurring would occur more than before. However, we were unable to locate a major study that addressed predictors of interference in both domains, to understand whether specific factors might explain interference in different domains simultaneously. Most studies on interference focus on factors affecting personal life with work interference only, ignoring directionalities of interferences as well as different sources of them (Carlson et al., 2000; Chen and Karahanna, 2018; Derks et al., 2015; Greenhaus and Beutell, 1985; Reynolds and Renzulli, 2005). In addition, research on the interference tends to examine stability or difficulty in changing variables, such as demographic differences (see Byron (2005) for review). Therefore, the previous models of interference studies have limited actionable knowledge that empower individuals by acknowledging the control they have over how they experience work and life interferences. To find ways to enhance work and life balance, especially in the context of SmartWork, factors having effects on the work/nonwork interferences and their relationships should be further investigated.

Building on recent studies investigating work/nonwork interference (Furtado et al., 2016; Park and Jex, 2011), our objective is to gain better understanding of factors that influence boundary creation and interferences at both work and nonwork domains, which may not be the same. The present study focuses on SmartWork user's boundary creation as a potential means to reduce psychological work-nonwork interference. The assumption of this study is workers build a psychological boundary between work and nonwork, determine the strength of it, actively reduce interferences (Ashforth et al., 2000), and manage them individually with job autonomy (Ahuja and Thatcher, 2005). In this paper, drawing on boundary theory, we empirically investigate the role of work/nonwork boundary strength and job autonomy on the work/nonwork interferences.

Little is known concerning the antecedents and mechanisms to explain psychological work and interferences in the context of SmartWork considering directionalities of interferences. Therefore, assuming that two-way interference is possible in SmartWork, this study conducted an empirical study on (1) the strength of boundaries and (2) the role of job autonomy in relation to interference between work and nonwork domains. From a management perspective, knowing the nature of interference between work and nonwork may help to design policies and solutions that maximize both work productivity and reduce interferences. Adopting SmartWork without enough preparation may increase work productivity and availability in the short term, but also lead to reduced work and life balance. Better understanding of factors affecting interference between work and nonwork would lead to more effective SmartWork policies and atmospheres being developed in modern organizations.

The rest of the paper is organized as follows. The following section briefly reviews the boundary theory and related literatures. Then, the research hypotheses and model are developed. To test the hypotheses, survey instruments were developed, surveys were performed and statistically analyzed. This paper concludes with contributions and limitations of the paper, and makes suggestions for future research.

## Ⅱ. Boundary Theory and Boundary Management Strategy

### 2.1. Boundary Theory

The theoretical background of this research follows propositions from boundary theory which explains the process of negotiating and maintaining boundaries between work and nonwork. According to boundary theory, individuals confine themselves to a limited boundary to simplify and categorize the world around them, (Ashforth et al., 2000). Boundary is determined physically, temporally and psychologically as well. For example, home based teleworkers construct work boundaries by creating a physical workspace, marking the space with equipment and furniture, restricting the access of family members, rescheduling nonwork activities and setting clear work times to create an informal physical and temporal boundary. As such, the boundary between one's work and nonwork determines the surroundings and ranges of a given domain and establishes their distinctiveness (Hecht and Allen, 2009). Therefore, boundaries are "mental fences" and the domain of real life is created through boundary creation (Zerubavel, 1991).

Boundary theory started from the interests in enhancing work performance by appropriately managing the diverse roles an individual could play. Early researchers focused on the negative effects caused by managing multi roles (Parasuraman and Greenhaus, 2002). Especially conflicts between work and family duties are known to cause decrease in job satisfaction (Allen et al., 2000), decrease in life satisfaction (Kossek and Ozeki, 1998), withdrawal from work (Hammer et al., 2003), and depression (Frone et al., 1992a).

However, it is suggested that multi roles can be also appropriately managed by active organization of diverse roles. Hall and Richter (1989) addressed the idea of "active organization of diverse roles" and insisted workers balanced work and nonwork with the method of active organization of permeable boundaries. Nippert-Eng (1996), in a follow-up study, contributed to boundary theory by observing the ways an individual negotiated with diverse domains.

Especially it is emphasized that workers create work/nonwork boundaries by intended segmentation and integration. It is well aligned with a theoretical assumption in polychronicity studies, which assumes that individuals vary in their preference to be engaged in multiple tasks simultaneously (Bluedorn et al., 1999; Richardson and Benbunan-Fich, 2011).

People do not stay only in one domain, but perform activities crossing various domains. A boundary can be built thin (weak) or thick (strong). A thin and weak boundary is "permeable" and likely to "integrate" several separate domains. But a thick and strong boundary is "nonpermeable" and apt to "segment" the domains (Ashforth et al., 2000). Some workers maintain a strong boundary between work and nonwork domains in an attempt to keep them separate, but others form a weak boundary and allow a degree of integration between the two domains (Nippert-Eng, 1996). To summarize, a strong boundary is built to maintain segmentation and a weak boundary is constructed to facilitate interaction across the boundaries (Ashforth et al., 2000; Clark, 2000). Expanding the boundaries and crossing the boundaries of different domains can occur in either thin or thick boundaries, Clark (2000) asserted that individuals built boundaries with different strengths around each respective domain. Developing the idea of Clark (2000) and Nippert-Eng (1996), Ashforth et al. (2000) also proposed that individuals vary in their preferences of boundary strength to different domains. Recently, research on work/nonwork inter-ferences considering their bidirectional nature has grown attention (Ashforth et al., 2000; Bulger et al., 2007; Furtado et al., 2016; Golden et al., 2006; Olson-Buchanan and Boswell, 2006), indicating the limitations of previous research which did not consider the bidirectionality of the interferences, but little empirical work has directly compared the strength of work/nonwork boundaries.

In addition to individuals framing their boundaries differently, Kreiner et al. (2009) suggested that a boundary is socially constructed so that collectives can develop shared norms about the boundary strength of given domains. For example, workers tend to have very weak boundaries at home and very strong boundaries at work (Perlow, 1998). However, boundaries, if only shared socially, so that they cannot easily be changed or eliminated (Zerubavel, 1991). But boundaries, whether thin or thick, go through changes via unfreezing-move-ment-freezing (Lewin, 1951), cognitive leap between categories (Zerubavel, 1991), boundary spanning (Ashforth et al., 2000), and spill over (Ilies et al., 2009). Although boundary strengths can be sig-nificantly changed as one enters a new role, but then remain relatively stable as occupancy of the new role is maintained and institutionalized over time (Ashforth et al., 2000; Hecht and Allen, 2009). Thus, it causes and consequences should be unchanging as well. Therefore, the current study which explores factors affecting consistency of both dimensions of boundary strengths which is important to gain further understanding of interference between work and nonwork (Furtado, 2016).

## 2.2. Boundary Management Strategy

Boundary management strategy means the strategy used to construct, maintain and adjust social bounda-ries between work and nonwork (Nippert-Eng, 1996). Boundary management strategy can be shown along a segmentation-integration continuum (Ashforth et al., 2000; Nippert-Eng, 1996; Tietze, 2002). The seg-mentation-integration continuum was intended to provide a means to understand how an individual negotiates with various domains (Nippert-Eng, 1996).

When work and non-business areas are fully integrated, there is no distinction between work and nonwork activities, and, furthermore, it is not clear when and where activities take place.

The idea of actively segmenting or integrating an individual's work and nonwork domains is a key concept in the boundary theory. In other words, an individual creates his/her work and nonwork boundaries through the intended segmentation and integration methods (Nippert-Eng, 1996). Individual's boundary management strategies are determined by two elements: *permeability* and *flexibility*. Permeability refers to the extent to which an individual might be psychologically and/or behaviorally engaged in one domain, while physically located in another (Ashforth et al., 2000; Clark, 2000). For example, a work boundary is permeable if the employees is contacted by family while at work (Bulger et al., 2007). Flexibility refers to the degree to which the boundaries of a role are elastic and mutable (Ashforth et al., 2000). For example, a work boundary is flexible if the employee perceives that he or she could leave work to attend to a family matter (Bulger et al., 2007). The strategies that individuals use to manage boundaries between their work and nonwork domains create segmentation-integration continuum. Specifically, segmentation exists in conditions where there are both low permeability and flexibility of the domain boundary. Integration, on the other hand, maintains high permeability and flexibility at both the domain boundaries. In an integrated domain, individuals maintain a fully integrated area of work and nonwork. The original boundary management strategy provides a limited choice of strengthening or mitigating segmentation or integration of boundaries along the continuum (Ashforth et al., 2000; Nippert-Eng, 1996).

This limited boundary management strategy is rel-evant to the issue in relation to boundary theory to view the effects between domains as either one way (Kreiner, 2006) or in bidirections (Ashforth et al., 2000). In work environments that utilize ICTs, such as SmartWork, there are bidirectional features in which work and nonwork domains invade each other's ones. Bi-directionality of work/nonwork boundaries presupposes 'asymmetric permeability' (Pleck, 1977) that the permeability between work and nonwork domains acts asymmetric rather than symmetrical. Clark (2000) suggested that this possibility of asymmetric penetration depends on asymmetric boundary strength between work and nonwork domains. According to Perlow (1998), workers tend to build boundaries that are weak at home, while strong at work. In particular, it can be seen as a result of asymmetrical permeability that researchers actively conducted on nonwork interference caused by work rather than work interference caused by non-work activities (Eagle et al., 1997; Frone et al., 1992b). Recently, it also suggests that work using ICTs also create asymmetric interference between work and nonwork domains (Furtado, 2016; Park and Jex, 2011).

As we have discussed earlier, permeability and flexibility form boundary strength, but permeability is a necessary condition (Glavin and Schieman, 2012) for boundary management and a key factor in shaping boundary strength. The reason is that the permeability reflects the degree to which an individual is physically located in one area, but psychologically and behaviorally involved in the activities of another (Ashforth et al., 2000). In other words, the permeability is difficult to control and it can be regarded as a practical interference that workers must endure (Bulger et al., 2007). SmartWork also implies a high level of flexibility in boundary theory, as it presupposes moving beyond the usual domain of time and

space. Flexibility can also be viewed as a characteristic of tasks determined by the type of SmartWork (SmartWork center, telework, mobile work, etc.) rather than as a personal nature. In SmartWork situations, the permeability plays an important role in shaping the psychological boundary strength of workers.

## Ⅲ. Research Model and Hypotheses

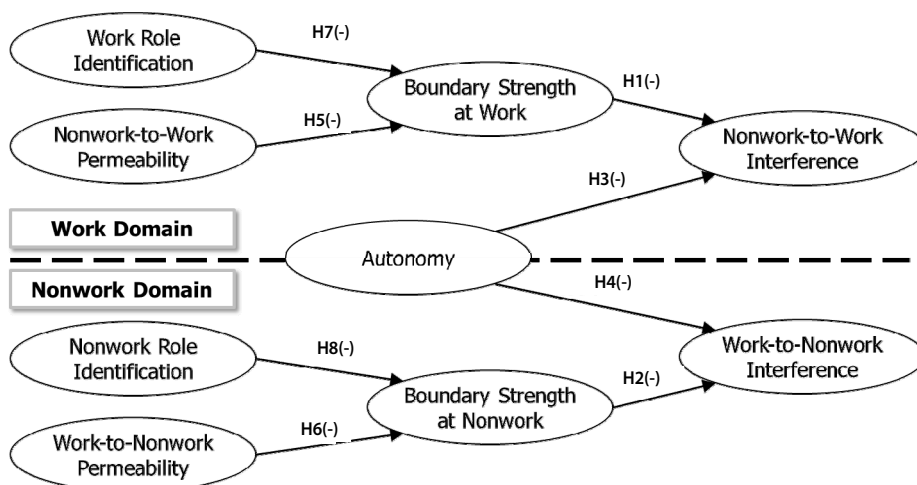### 3.1. Research Model

In this research, we set up a research model as shown in <Figure 1>. Following studies (Ashforth et al., 2000; Clark, 2000; Hall and Richter, 1989) which assume that individuals are attending to work and nonwork domains with their separate norms and expectations, simultaneously, work and nonwork domains are separated in our research model for better understanding of different factors affecting boundary strength and interference around each domain. In a work domain, boundary strength at work and autonomy are main factors decreasing non-

work to work interferences. Boundary strength at work is weakened by nonwork to work permeability, positively influenced by work role identification, and mediates the effects of them to decrease nonwork to work interferences. In a nonwork domain, both boundary strength at nonwork and autonomy have negative effects on the work to nonwork interferences. Boundary strength at nonwork is influenced by nonwork role identification (positive) and work to nonwork permeability (negative), mediates the effects of them to decrease work to nonwork interferences.

### 3.2. Research Hypotheses

#### 3.2.1. Boundary Strength, Work Autonomy, and Interferences

It has been argued that allocating personal resources such as time psychological attention and physical energy to one role reduces their availability for another role (Edwards and Rothbard, 2000). From this perspective, decreasing boundary strength at nonwork depletes the resources available to fulfil nonwork roles. As boundary strength around a cer-



<Figure 1> Research Model

tain domain decreases, it seems likely that resources are depleted from that domain, causing significant interference between domains to occur (Hecht and Allen, 2009). For example, an individual with a weak work boundary integrates nonwork into work and performs private tasks during office hours, which will increase nonwork interference with work. In the same way, an individual with a strong nonwork boundary segments nonwork from work and this will decrease work interference with nonwork. Similarly, studies on teleworkers also suggest that strong boundaries at home were associated with low levels of work and family conflict. This leads to the following H1 and H2.

H1: *Boundary strength at work has negative impact on nonwork interference with work.*

H2: *Boundary strength at nonwork has negative impact on work interference with nonwork.*

Job autonomy also influences interferences. If individuals have autonomy and control over the works undertaken, interferences can be prevented or escaped. Job autonomy can be defined as "the degree to which the job provides substantial freedom, independence, and discretion to the employee in scheduling the work and in determining the procedures to be used in carrying it out" (Hackman and Oldham, 1975, p. 162). Job autonomy influences the employees' perception on their authorities to start, perform, and complete jobs (Kaldenberg and Becker, 1992; Xie and Johns, 1995). The meaning of job autonomy includes autonomy on time and place as well as on the work itself (Annink and den Dulk, 2012).

Individuals applying ICTs skills at work are likely to show higher job autonomy. ICTs provide opportunities that individuals manage schedules and respond to sudden requirement changes autono-

mously (Ahuja and Thatcher, 2005). In the context of SmartWork where ICTs are utilized, individuals are provided with relatively higher degree of autonomy because they have to be involved in determining where, when, and how to work, and where, when, and how to nonwork as well. Thomas and Ganster (1995) reported that in a study of healthcare professionals, higher job autonomy led to less work/nonwork interferences. This leads to the following H3 and H4.

H3: *Job autonomy has negative impact on the nonwork to work interferences.*

H4: *Job autonomy has negative impact on the work to nonwork interferences.*

### 3.2.2. Permeability, Role Identification, and Boundary Strength

Boundary theory posits that boundary strength is most closely associated with permeability and flexibility (Ashforth et al., 2000). Permeability is defined as "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" (Pleck, 1977). Permeability is related with individuals placed at a time and/or a location of one domain but performing activities of other domains. For example, the work boundary of a worker calling a family member during office hours can be regarded as permeable. Flexibility is defined as "the degree to which the spatial and temporal boundaries are pliable" (Hall and Richter, 1989). If the boundary strength of a domain becomes weak for an individual to perform activities of other domains, then it is flexible. For example, work boundary of a worker leaving the office for a family affair can be regarded as flexible. One the other hand, inflexible boundaries can restrict

such free role transition (e.g., during class sessions, the school teacher is forbidden from allowing attention to waver from work).

Nippert-Eng(1996) explained the individual strategies of boundary management were along a continuum ranging from full segmentation to full integration. In other words, work and nonwork domains can be treated as integrated or segmented to varying degrees depending on how individuals perceive their work and nonwork boundary. Segmentation means low flexibility and permeability of boundaries and integration signifies high flexibility and permeability. According to Ashforth (2000), the primary benefit of segmentation is that it reduces the blurring between roles by building a clear setting and time around each role. On the other hand, high integration, which means highly flexible and permeable boundaries, makes it difficult to manage, creates frequent role confusion and frequent interruption.

There appears to be a strong empirical support for increased integration of the work and nonwork domain with SmartWork users, who are heavy users of ICT for work (e.g., Diaz et al., 2012; Fonner and Stache, 2012; Park and Jex, 2011). Given high boundary flexibility and permeability, interferences between highly integrated roles tend to be relatively high. To overcome such challenges in the given context and to foster their work and life balance, SmartWork users actively choose the preferred way of boundary management on the segmentation- integration continuum (Ashforth et al., 2000) with wide variation in the degree of boundary strengths for each domain.

Although both permeability and flexibility are the main factors to form boundary strength, permeability seems to be the focal element to boundary construction and a necessary condition (Ashforth et al.,

2000; Glavin and Schieman, 2012; Olson-Buchanan and Boswell, 2006) to boundary management. The Oxford dictionary meaning of *strength* is the "ability to endure power and pressure" and permeability reflects the extents of psychological and/or behavioral involvement in activities of other domains while physically staying in one domain (Ashforth et al., 2000). That is, permeability is at the core of boundary strength and it is the real interference workers need to endure.

In addition, previous research also noted differences in the direction of permeability (Hill et al., 2003). Perlow (1998) reported that workers had a strong work boundary and a weak family boundary. More studies on work interference with nonwork have been accomplished than on nonwork interference with work (Eagle et al., 1997; Frone et al., 1992b) and it shows asymmetric permeability in a way (Hecht and Allen, 2009). Authors (reference omitted intendedly) also investigated the asymmetric nature of permeability and empirically verified that individuals had strong work boundaries and relatively weak nonwork boundaries. Such differential permeability plays an important role when workers construct boundary strengths at each domain. Assuming that that the boundary between work and nonwork may be asymmetrically permeable, the following H5 and H6 are formulated;

H5: *Nonwork to work permeability has negative impacts on the boundary strength at work.*

H6: *Work to nonwork permeability has negative impacts on the boundary strength at nonwork.*

Generally, individuals identify themselves as a member of organizations and religions and live as an employee, parents, and a community member. According to social identity theory, individuals like

to behave consistently with their identities, and attempt to invest resources into roles they identify themselves with (Lobel, 1991). For example, when individuals identify themselves with a work role, they are inclined to spend more time and energy in work related activities because they place high value on the work aspect (Stryker, 1980). Fenner and Renn (2004) also argue employees high in work identification will be internally motivated to extend their workday because they consider their work central to their existence.

Boundary theory asserts that role identification impacts on the creation of boundaries between the roles (Ashforth et al., 2000). When identification of a role is higher, an individual creates a domain where he/she can make more commitments to the role. Further, boundary strength is formed in a way that a domain of higher role identification integrates other domains (Clark, 2000). Hecht and Allen (2009) empirically verified that higher job role identification led to higher work boundary strength, and higher nonwork role identification led to higher nonwork boundary strength. As such role identification in a domain can be understood as leading activities protecting the domain from permeation.

Work/nonwork role identification is an activity of choosing one central role between work and nonwork. Thus, role identification is related to active psychological boundary creation. Drawing on social identity theories which state that individuals desire to behave in ways that are consistent with their identities (Ashforth et al., 2000). We predict that individuals involve themselves with a domain when the role identification of the domain is high. This leads to the following hypotheses.

*H7: Work role identification has positive impacts on the boundary strength at work.*

*H8: Nonwork role identification has positive impacts on the boundary strength at nonwork.*

## Ⅲ. Research Methods and Results

### 4.1. Research Subjects and Measurement

Research subjects are the users of SmartWork. It is necessary to take proper samples to investigate the role of boundary strength and autonomy on the work/nonwork interferences. Generally information system usage is accomplished by the interactions of users, information systems, and tasks (Burton-Jones and Straub, 2006). The same applies to this research and subjects should use similar information systems, have similar job characteristics that guarantees homogeneity. Sampling SmartWorkers from a single organization permits greater internal validity than examining SmartWorkers across organizations. This study was undertaken with SmartWork users in company K, which is one of leading telecommunication service providers in Korea, where SmartWork is most actively adopted within Korea since 2010. Thus, with growing interest on alternative work arrangement in Korea, SmartWork is one option that many Korean companies have examined to remain competitive, cut cost and at the same time offer employees flexibility in their work arrangements. The new work environment in Company K aims to allow their employees to choose their physical workplace. Employees are given the flexibility of working from home or in a SmartWorking center near to their home, thereby maintaining a balance between work and life. Among the SmartWork users at Company K, the survey was conducted specifically targeting users who worked at home or in the form of work at SmartWork center. Because they are actually the only case where bounda-

ries between work and nonwork domains are becoming blurred.

Questionnaires were developed to measure 9 constructs used in the hypotheses. All of the survey items were chosen from previous research where reliability and validities were verified, and slightly modified pertinent to the research context. All the items were measured on a 7 point Likert scale. Pilot tests were performed with the professionals and practitioners in company K, and final questionnaire items were prepared. On the survey web site, the survey was performed for a week with executives and employees of company K. Participation was voluntary and respondents were assured confidentiality. 333 surveys were completed and collected, and 286 sur-

veys were put into analysis, excluding those with many missing responses and patterned responses. Demographic characteristics of the respondents were similar to those of all the employees of company K.

Demographics are shown in <Table 1>. Male respondents were 228 (79.75%), and female were 85 (20.3%). Many respondents were in their 40s (41.2%), and 113 respondents were in their 30s, thus, it was shown that the majority of respondents were in their 30s and 40s. For the tenure years with the company, 49.3% of respondents were less than 10 years with the company and 230 respondents (80.5%) have been SmartWork users for less than 12 months. Such distribution is similar to the ratio that is indicative to that of the figures which were produced from

<Table 1> Descriptive Statistics of Respondents

| Description | | Samples(persons) | Ratio(%) |
|---|---|---|---|
| Gender | Male | 228 | 79.7% |
| | Female | 58 | 20.3% |
| Age | 25-30 | 39 | 13.6% |
| | 31-35 | 50 | 17.5% |
| | 36-40 | 63 | 22.0% |
| | 41-45 | 87 | 30.4% |
| | 46-50 | 31 | 10.8% |
| | > 51 | 16 | 5.6% |
| Tenure | Less than 5 Years | 101 | 35.3% |
| | 6-10 Years | 40 | 14.0% |
| | 11-15 Years | 52 | 18.2% |
| | 16-20 Years | 66 | 23.1% |
| | 21-25 Years | 19 | 6.6% |
| | Over 26 Years | 8 | 2.8% |
| SmartWork Usage Period | Less than 6 Months | 122 | 42.7% |
| | 7-12 Months | 108 | 37.8% |
| | 13-18 Months | 30 | 10.5% |
| | 19-24 Months | 25 | 8.7% |
| | Over 25 Months | 1 | .3% |
| Smart Usage Type | SmartWork Center | 22 | 7.7% |
| | Telecommuting | 192 | 67.1% |
| | SWC+Teleocommuting | 72 | 25.2% |

employers of company K. Use of the 'SmartWork' scheme via working at home or, working at home and also using the SmartWork centre in conjunction has been found to have been 92.3%. This has also been highly correlated to the figures which are known from the case of company K. Therefore, these figures display validity in the samples which were used.

## 4.2. Measurment

Questionnaires were developed to measure 9 constructs – work role identification, nonwork role identification, work to nonwork permeability, nonwork to work permeability, boundary strength at work, boundary strength at nonwork, work to nonwork interference, nonwork to work interference,

<Table 2> Measurement

| Construct | Questionnaire Items | References |
|---|---|---|
| Work Role Identification | - The most important things that happen to me involve my present job.<br>- I am very much involved personally in my job.<br>- Most of my interests are centered around my job.<br>- Most of my personal life goals are job-oriented.<br>- I consider my job to be very central to my existence. | Kanungo (1982); Park and Jex (2011) |
| Nonwork Role Identification | - Quite often I plan ahead the next day's family activities.<br>- I am very much involved personally with my family members' lives.<br>- The most important things that happen to me are related to my family roles. | Yogev and Brett (1985); Park and Jex (2011) |
| Work to Nonwork Permeability | - I don't mind receiving work-related calls while I am at home.<br>- I am willing to take care of work-related business while I am at home.<br>- I don't like having work-related items at my home. (R) | Clark (2002); Richardson and Benbunan-Fich (2011) |
| Nonwork to Work Permeability | - I don't mind receiving family-related calls while I am at work<br>- I am willing to take care of family-related business while I am at work.<br>- I don't like having family-related calls at work. (R) | Clark (2002) |
| Boundary Strength at Work | - I often schedule personal activities (e.g., exercise or reading) during business hours. (R)<br>- I try to spend time communicating with friends and family during business hours. (R).<br>- I often think about my personal life when I am working. (R) | Hecht and Allen (2009) |
| Boundary Strength at Nonwork | - I never do work on my personal time.<br>- I never take my work out of the office.<br>- My personal time is my own<br>- I often do work at home (R). | Hecht and Allen (2009) |
| Work to Nonwork Interference | - My job or career often interferes with my responsibilities at home.<br>- My job or career often keeps me from spending the amount of time that I would like to spend with my family.<br>- My job or career interferes with my home life. | Carlson and Frone (2003); Park and Jex (2011) |
| Nonwork To Work Interference | - My home-life interfere with my responsibilities at work.<br>- My home-life keep me from spending the amount of time I would like to spend on job or career-related activities.<br>- My home-life interferes with my job or career. | Carlson and Frone (2003); Park and Jex (2011) |
| Autonomy | - I control the content of my job.<br>- I have a lot of freedom to decide how I perform assigned tasks.<br>- I set my own schedule for completing assigned tasks.<br>- I have the authority to initiate projects at my job. | Beehr (1976); Ahuja et al. (2007) |

Note: R: reverse coding

and job autonomy – used in the hypotheses. All of the survey items were chosen from previous research where reliability and validities were verified, and slightly modified pertinent to the research context (see <Table 2>). All the items were measured on a 7 point Likert scale.

## 4.3. Reliability and Validity

The data collected were analyzed using IBM Statistics SPSS 24 and SmartPLS 3. To validate the internal consistencies of measurement items of each construct, Cronbach's alpha was used and the reli-

<Table 3> Descriptive Statistics & Reliability and Convergent Validity

| Construct | Items | loadings(t-value) | $M$ | $SD$ | $a$ | CR | AVE |
|---|---|---|---|---|---|---|---|
| Work Role Identification | WRI01 | .876(48.356) | 5.199 | 1.120 | .929 | .946 | .779 |
| | WRI02 | .894(63.591) | | | | | |
| | WRI03 | .898(61.156) | | | | | |
| | WRI04 | .857(43.026) | | | | | |
| | WRI05 | .887(64.008) | | | | | |
| Nonwork Role Identification | FRI01 | .751(3.584) | 4.983 | 0.996 | .796 | .845 | .652 |
| | FRI02 | .987(4.563) | | | | | |
| | FRI03 | .647(2.462) | | | | | |
| Work-to-Nonwork Permeability | W2FP01 | .824(19.259) | 4.888 | 1.394 | .796 | .880 | .709 |
| | W2FP02 | .820(24.170) | | | | | |
| | W2FP03 | .881(42.920) | | | | | |
| Nonwork-to-Work Permeability | F2WP01 | .828(35.744) | 3.720 | 1.156 | .798 | .881 | .711 |
| | F2WP02 | .839(32.490) | | | | | |
| | F2WP03 | .863(49.106) | | | | | |
| Boundary Strength at Work | BSTW01 | .891(62.592) | 4.609 | 1.203 | .866 | .918 | .788 |
| | BSTW02 | .881(54.227) | | | | | |
| | BSTW03 | .892(59.024) | | | | | |
| Boundary Strength at Home | BSH01 | .808(25.077) | 3.399 | 1.202 | .815 | .878 | .644 |
| | BSH02 | .841(33.861) | | | | | |
| | BSH03 | .759(21.132) | | | | | |
| | BSH04 | .799(27.164) | | | | | |
| Work-to-Nonwork Interference | W2FI01 | .892(49.934) | 4.021 | 1.343 | .900 | .937 | .833 |
| | W2FI02 | .938(86.434) | | | | | |
| | W2FI03 | .908(50.357) | | | | | |
| Nonwork-to-Work Interference | F2WI01 | .856(35.785) | 2.431 | 1.020 | .824 | .895 | .739 |
| | F2WI02 | .829(24.822) | | | | | |
| | F2WI03 | .893(49.792) | | | | | |
| Autonomy | AUTO01 | .902(47.559) | 5.268 | 1.124 | .923 | .945 | .811 |
| | AUTO02 | .931(88.029) | | | | | |
| | AUTO03 | .886(39.732) | | | | | |
| | AUTO04 | .882(41.889) | | | | | |
| Suggested criteria | | >.7 or (>2.0) | | | >.7 | >.7 | >.5 |

Note: M mean, SD standard deviation, a Cronbach's alpha, CR composite reliability, AVE average variance extracted

abilities of each construct were tested. If Cronbach's alpha is over .7, the reliability of the measurement instrument can be validated (Nunnally, 1967). The minimum of Cronbach's alphas of constructs used in the analysis is .796 and satisfied the criterion. Cronbach's alpha of each construct shows internal consistencies of measurement items of each construct. Through structural equation modeling (SEM), composite reliability and average variance extracted (AVE) are calculated to confirm the reliabilities of each construct once again. Every value is higher than recommended criterion (Composite reliability over .7, AVE over .5). Confirmatory factor analysis is performed to verify the convergent validity. Generally, if loaded value is over .7 or t-value is over 2.0 (Steenkamp and van Trijp, 1991), then convergent validity is verified. Most of the loaded values are over .7. In several items, loaded value is below the recommendation, but the corresponding t-values are over 2.0, and this marginally shows the convergent validity of the measurement.

We used the squared roof of AVE to test discriminant validity, meaning that different constructs have considerable differences among each other. As shown on <Table 4>, all the square root of the AVEs are greater than .707 and the diagonal square root of each AVE is larger than the correlations that are off the diagonal (Fornell and Lacker, 1981). These results met the suggested criteria for verification of the discriminant validity.

Analysis of the credibility of the research constructs of the subject research model indicates reliability and validity are all above the suggested threshold, supporting clear reliability and validity of the measurement.

The common method bias is one of issues of cross-sectinal studies, so it was also asssed. There are a lot of suggestions to identify the bias such as Harman's one factor test (Podsakoff and Organ, 1986) and marker variable approach by Lindell and Witney (2001). Recently a full collinearity test is suggested, when PLS is used. We followed Kock (2015)'s procedure and carried out a full collinearity test based on variance inflation factors (VIFs). VIFs are calculated for each construct in the model and, if such VIFs are all below the threshold of 3.30, common method bias is not a problem (Kock, 2015). Our estimations show that VIF valuses range from values

<Table 4> Discriminant Validity - Correlations and AVEs

| | 1 | 2 | 3 | 4 | 6 | 5 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Work Role Identification | .882[a] | | | | | | | | |
| 2. Nonwork Role Identification | .096[b] | .807 | | | | | | | |
| 3. Work-to-Nonwork Permeability | .326** | -.057 | .842 | | | | | | |
| 4. Nonwork-to-Work Permeability | -.256** | .203** | -.022 | .843 | | | | | |
| 5. Boundary Strength at Work | .351** | -.094 | .125* | -.559** | .888 | | | | |
| 6. Boundary Strength at Nonwork | -.132* | .107 | -.308** | -.058 | -.059 | .802 | | | |
| 7. Work-to-Nonwork Interference | -.078 | -.086 | .002 | .101 | .004 | -.316** | .913 | | |
| 8. Nonwork-to-Work Interference | -.203** | -.057 | -.159** | .259** | -.320** | -.012 | .223** | .860 | |
| 9. Autonomy | .450** | .114 | .323** | -.133* | .194** | -.104 | -.162** | -.204** | .900 |

Note: a diagonal: square root of Average Variance Extracted(AVE), b off-diagonals: correlation between latent variables
*$p$ < .05, **$p$ < .01 (two-tailed)

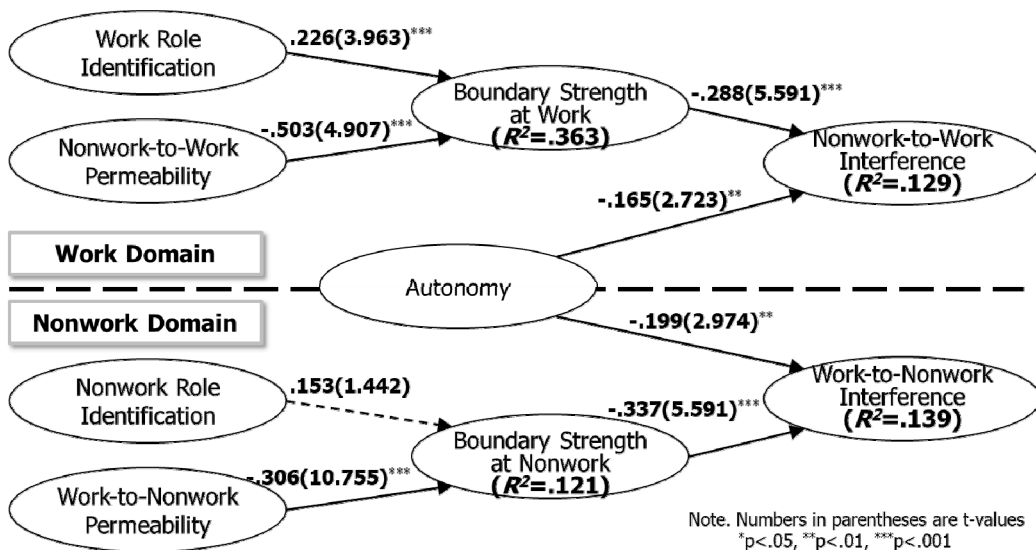less than 1.000 to 2.084, suggesting no evidence of common method bias in this research.

## 4.4. Hypotheses Testing

This study aims to demonstrate the roles of boundary strength and job autonomy which reduces work/nonwork interference based on the assumptions about the bidirectional nature between work and nonwork sphere is under the SmartWork environment.

The results indicated that the bidirectional nature of the work/nonwork boundary is an appropriate assumption for this research. It has been confirmed by verifying the asymmetry of the work/nonwork boundary strength. In this study, we have utilized the paired t-test in order to confirm the asymmetry in work/nonwork boundary when SmartWork has been adopted. The average between work boundary strength and nonwork boundary strength found were both 4.609 and 3.399, and the difference found was 1.210. As per the result from the paired t-test, t

value and significance probability were 11.686 and .000, indicating significant statistical difference within the 95% credibility level. This result reinforces the bidirectional nature of work/nonwork boundary found by other researchers (Ashforth et al., 2000; Bulger et al., 2007; Golden et al., 2006; Olson-Buchanan and Boswell, 2006). This points out to us that the users of SmartWork perceive that work domain's boundary strength is stronger than that of boundary strength of the nonwork domain. This study added to the substantial prior studies that dealt with asymmetrically permeable boundaries (Ashforth et al., 2008; Pleck, 1977) between work and nonwork. It may be due to high expectations from the organization to work uninterrupted during office hours and to juggle their nonwork needs to accommodate work demand (Ashforth et al., 2008). This would suggest greater difficulties to maintain boundary strength at the nonwork domain to defend against work demands, particularly within the SmartWork environment.

SEM analysis is performed to test the hypotheses



<Figure 2> Structural Model Testing Results

with SmartPLS 3 (Ringle et al., 2015), which provides a bootstrapping algorithm and calculates the path coefficients and t-values. As shown in <Figure 2>, this research has respectively set 4 hypotheses each for both work domain and nonwork domain. The result of the SEM analysis indicates the 4 hypotheses proposed for the work domain were accepted.

In the work domain, boundary strength at work, which is a mediating variable, has been found to reduce nonwork interference (H1), and nonwork to work permeability was found to weaken the boundary strength at work (H5). Conversely, it was found that work role identification reinforces work intensity through strong boundary strength at work. (H7). Also, job autonomy has been found to be an important factor in reducing nonwork to work interference (H3). The coefficient value ($R^2$) of boundary strength at work and nonwork to work interference, indicated both .363 and .129, illustrating high explanation value of the research model.

In the nonwork domain, all hypotheses were accepted except the one that hypothesized the positive effects of nonwork role identification on the boundary strength at nonwork (H8). This showed if a worker has a high nonwork role, it does not affect reinforcement of boundary strength at nonwork. Further, this could imply generally a lower level of boundary strength at nonwork. Similar to work domain, nonwork boundary strength was shown to reduce work to nonwork interference (H2). In addition, it was confirmed that job autonomy reduced work to nonwork interference within the nonwork domain (H4). The coefficient value of nonwork boundary strength and work to nonwork interference indicated both .121 and .139, illustrating relatively low explanation value compared to the work domain research model. All $R^2$ are at least .121, which is above the criterion of .10 suggested by Falk and Miller (1992).

## Ⅴ. Discussion

This study aims to explore the structure and factors which could reduce the interferences between work and nonwork in the SmartWork context. In detail, considering the bidirectional nature of work and nonwork boundary permeability, we investigated whether work/nonwork boundary strengths and job autonomy can play a role in reducing work/nonwork interferences. In addition, the mediating role of boundary strength, which is affected by role identification and permeability, is also investigated.

First, the paired t-test was used to verify the adequacy of the asymmetrical nature of the work/nonwork boundary strength as presupposed in the establishment of this research model. As a result, we identified the asymmetry of work/noneotk boundry strength perceived by SmartWork users. The study confirmed that the task/non-business asymmetry that was raised in the previous study (Clark, 2000; Plek, 1977) also occured in the SmartWork environment. Findings show that SmartWork users build stronger boundary strength in their work domain than in nonwork domain.

Consistent with H1 and H2, although permeability into nonwork from work domain weakens the boundary strength at work, and permeability of the work to nonwork domain weakens the boundary strength at nonwork, SmartWork users can proactively mitigate interference from work to nonwork domain, and vice versa, through boundary management strategies that form asymmetric boundary strength. While permeability of work and nonwork domains is increased in SmartWork environment based on ICT, it can be inferred that the asymmetric boundary management strategy actively mitigates inter-domain interference, thus promoting work-life balance. In other words, although permeability has a negative effect

on boundary strength, it can be seen that the boundary management strategy is actively pursued to the segmentation that increases boundary strength, thus reducing interference. Throughout the study, the assertion made from boundary theory; a person with strong boundary strengths will segment between work and nonwork to make it impermeable and reduce cross-role interference (Ashforth et al., 2000), has been verified to be applicable within the SmartWork environment.

The negative effect of job autonomy on work and nonwork interference, which has been suggested in many different scenarios such as medical professionals (Thomas and Ganster, 1995), telecommuters (Goldstein, 2003), and flex workers (Beham et al., 2011) has also been found to be applicable to the SmartWork scenario. We have further concluded that the job autonomy effect not only reduces the work with nonwork interference but also the nonwork with work interference in both domains.

However, in the case of role identification, a contradicting result was found in the two domains. It was expected, and has been statistically supported, that work boundary strength will increase as work role identification increases within the work domain. The hypotheses of nonwork role identification affecting nonwork boundary strength within the nonwork domain has been rejected. While nonwork role identification correlated with boundary strength at nonwork in the direction hypothesized, it did not significantly influence work to nonwork interference, contrary to the findings with road warriors (Hecht and Allen, 2009). In the case of SmartWork participants, these results show that the participants perceive a nonwork role identification, however this does not assist in constructing boundary strength at nonwork. In terms of carrying out a task, only work role identification strengthens boundaries and

reduces nonwork interference within the work domain. In response, this means that in the scenario of carrying out a personal affair, perception of a nonwork role identification does not practically strengthen a nonwork boundary. Overall, it seems reasonable to suggest that strong work role identification can lead SmartWorkers to protect their work role from interference by nonwork roles by creating strong boundary at work, but not vice versa.

This result may be due to Korean's collectivist culture that emphasizes group needs over individual needs, compared with members of more individualist cultures. It could also be the culture of working long hours, Korean workers put in an average 45 hours at work each week, the longest among OECD countries (The Korean Times, 2012).

## Ⅵ. Research Implications

This study provides both theoretical and practical implications. First, theoretically, this study is meaningful in presenting antecedent factors and a mechanism to reduce the interference between work and nonwork domains necessary to promote a priority pursuit of work and life balance in SmartWork environment. Interference between work and nonwork domains is a major source of occupational stress (Sauter et al., 1990), and has long shown academic interest in ways to reduce it (Hall and Richter, 1989). The results of this research suggested that the boundary strength at work/nonwork and job autonomy are the negatively influencing factors on the interference between work/nonwork domains.

In addition, this research confirmed that boundary theory is applicable to SmartWork environment. At a time when the boundaries between work and nonwork domains are becoming blurred in SmartWork

environment, boundary theory is expected to have greater meaning, because the theory emphasizing the active construction of boundary strength (Clark, 2000) will provide implications for individuals' boundary management for work and life balance. This study shows that boundary strength, a key factor in boundary management strategy, has the effect of reducing interference in SmartWork environment. It is also expected that boundary theory can provide useful theoretical basis for understanding SmartWork users' pattern of forming and managing boundaries at a time when future developments in ICT are blurring the boundaries of work/non-work.

Even in the SmartWork environment, it has been confirmed that job autonomy is a major factor in reducing interference in the work and nonwork domains. Job autonomy has been considered an important job resource to control one's job (Schieman et al., 2009). The findings show that job autonomy in a SmartWork environment plays the faithful role of job resource to reduce interference from other areas, whether in a work domain or in a nonwork domain. Job autonomy allows individuals the discretion to determine the content, process, and schedule of their tasks themselves, thereby reducing work to nonwork (or nonwork to work) interference in SmartWork environment.

From a practical perspective, the blurred boundary between work and nonwork can increase the permeability between work and nonwork domains, which means that change management is necessary for the SmartWork environment. Since the formation of boundary strength, one of individual boundary management strategies, and high level of job autonomy reduce interference from other domains, the organizatons consider that boundary strength and job autonomy are essential conditions for implementing SmartWork. The findings show that in a SmartWork

environment, organizations should give job autonomy to individuals and support their active boundary management between work and nonwork domains.

This study presents the tasks needed to get SmartWork done properly by organizations that are preparing or already working on it. With our findings, organizations starting SmartWork environments should be mindful of their organizational member's variations in their preference for work and nonwork role integration and segmentation. Rather than relying on subjective norms, organization needs to create policies regarding to work. Organizations wanting to implement SmartWork will be able to determine the degree of preparation in SmartWork adoption by proactively investigating workers' boundary strength and job autonomy which are the interference reduction factors presented in this study. Based on these findings, the organization may seek ways to determine the styles of SmartWork and extent of changing management or to grant job autonomy. In organizations that have adopted SmartWork, it will be necessary to create organizational climate through change management, such as education, enactment or revision of rules, which are necessary to enhance the level of job autonomy and boundary strength at work/nonwork.

## Ⅶ. Research Limitations and Future Research Suggestions

Based on boundary theory, this study suggests that individuals take boundary management strategies centered on segmentation that strengthen boundary to reduce interference between work and nonwork domains in SmartWork environment. Boundary management strategies show that individuals can select their own strategies on a continuum of integration

and segmentation. This study has limitations that consider only permeability among the components of boundary strength. In future studies, it is necessary to generalize the boundary management strategies in SmartWork environment, taking into account the flexibility which is another component.

Unfortunately, the results show that work role identification has the effect of strengthening boundaries in the work domain, but not in the nonwork domain. In work domain, work role identification can strengthen the boundary strength at work, which, in turn, can reduce nonwork to work interference. On the other hand, the perception of nonwork role identification does not play a practical role in strengthening nonwork boundaries in situations where individuals carry out personal lives. The results show the limitations of ambiguous nonwork roles. In future studies, it is necessary to re-verify the roles of nonwork by segmenting them into family care, community activity, leisure, and hobbies.

The reduction of work/nonwork interference (Clark, 2000) and role conflicts between work and nonwork (Frone, 2003).

According to Jain and Nair (2013), both interference (conflict) and facilitation are considered to be key components of work and life balance (Jain and Nair, 2013), and the balance between work and life is logically defined the minimum amount of conflict and maximum amout of facilitation between roles (Frone, 2003). In addition, conflict and facilitation occur simultaneously and likely interact with each other (Wayne et al., 2017). This study has limitations in looking at work and life balance in terms of reduction of work/nonwork interference (Clark, 2000). In future studies, it is necessary to refine the concept of work and life balance to carry out research that encompasses not only the reduction of negative factor such as interference and conflict, but also the increase in positive factor such as facilitation.

Lastly, this study collected data from SmartWork users at Company K in Korea, where the boundaries between work and nonwork domains were becoming blurred. Although the findings are based on the unique Korean context, our findings around individual's boundary management strategies will be applicable to many potential users in smartworking environment. However, it is also recommended that future research should consider other countries with more individualistic culture rather than collectivistic culture like Korea, for better representativeness and generalization.

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