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The Differential Impacts of 'Communication' and 'Computing' Functions in Smartphones on Individuals' Performance and the Moderating Role of Organizational Roles

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ABSTRACT

This study investigated the antecedents and the performance impact of two types of Smartphone functions (communication vs. computing functions) in organizational environment and the moderating impact of Smartphone users' organizational roles. More specifically, identifying two distinct types of Smartphone functions such as communication functions and computing functions (including informational, social network, and resource management functions), we investigated the impact of three antecedents (Smartphone dependency, task mobility, and perceived critical mass) on the use of the two Smartphone functions and how organizational workers' perceived performance gains differ by using these two different Smartphone functions for their workplace activities. We tested our hypotheses with survey data collected from 176 organizational workers. Our findings suggest that Smartphone dependency, task mobility and perceived critical mass of Smartphone use are significantly associated with the use of the two different functions, and that the use of computing functions is more strongly associated with perceived performance gain than the use of communication functions. We also found that managerial roles played by individual workers differently moderate the impact of Smartphone use on perceived performance gain. The present findings enable researchers and practitioners to better understand the impact of Smartphone use in workplaces.

Keywords: Smartphone Impact, Managerial Roles, Social Network, Mobile Computing, Technology Dependency

Ⅰ. Introduction

Thanks to advanced mobile computing and telecommunications technologies, Smartphones have become a big part of our day-to-day lives and thus critical communication and computing tools in con-

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temporary workplaces. It is reported that, as of January 2017, about 66% of population in the world owns smartphones (Kemp, 2017) and there are over 70% of active Smartphone users in top 5 countries (UAE, Sweden, Switzerland, South Korea, and Taiwan) in terms of smartphone penetration (Newzoo.com, 2017). Smartphones provide users with not only various communication tools as being communication devices (e.g., text, voice, and video calling) but also various computing tools such as Internet browsers, social networks (e.g., Facebook, Twitter, etc.) and resource management tools (e.g., mobile office, personal digital assistant tools, etc.) as well (Carayannis and Clark, 2011; Maccormick et al., 2012). Since a Smartphone provides 'anytime-and-anywhere' accessibility to various communication and computing functions, it has not only changed the way we communicate, socialize, search information and manage digital resources, but also benefited organizational workers who use the device in their workplaces in various ways (Beurer-Zuellig and Meckel, 2008).

Both practitioners and scholars in the field of Information Systems have shown growing interests in the phenomenon of Smartphone use in workplaces. In the nutshell, they have expressed both benefits and concerns. For example, some practitioners testify that a Smartphone is actually an essential tool in workplaces, since it provides various communication tools, informational tools, and mobile enterprise applications (Chung et al., 2014) and people are now switching many parts of their workplace activities from desktop computers to Smartphones (McAlone, 2017). But others suggest that the personal use of Smartphones in workplaces also causes a number of problems that should be regulated (HRInsight, 2013).

Researchers have also reported both positive and negative aspects of Smartphones use in workplaces. Some argue that the use of Smartphones in organizations have positive impact because it improves individual performance (Chung et al., 2014), efficiency in collaboration (Beurer-Zuellig and Meckel, 2008), productivity (Carayannis and Clark, 2011), and decision making performance (Chen et al., 2004). Others argue that Smartphone use in workplaces does harm to workers as it may cause addiction and work disturbance (Karr-Wisniewski and Lu, 2010) and deteriorated work-life balance (Derks and Bakker, 2014; Price, 2010).

While these extant studies provide us with valuable findings and insights regarding the consequence of Smartphone use in workplaces, we believe that it is also needed to consider the Smartphone as a complex system that not only helps organizational members better communicate with others but also provides various computing tools such as social media functions, informational functions, resource management functions, etc. (Kemp, 2017; Lee et al., 2017).

In this study, rather than focusing on all sub-types of Smartphone computing functions (i.e., informational, interpersonal, and resource management functions) (Lee et al., 2017), we are more interested in examining the effect of the computing functions on organizational workers' perceived performance gain as compared to the effect of communication functions on perceived performance gain. By comparing both the distinct impact of communication and computing functions on individuals' perceived performance gain and the impact of key antecedents for these two Smartphone functions, we believe that meaningful insights can be drawn. In addition, we argue that the nature and the degree of the relationship between organizational workers' Smartphone use and their performance gain should depends on the specific organizational roles (Mintzberg, 1973). However, so far little effort has been made to investigate the ante-

cedents and consequences of using different types of Smartphone functions and the moderating effects of workers' organizational roles.

In sum, the purpose of this study is to investigate the antecedents of the two different types of work-related Smartphone functions (communication functions vs. computing functions) and their impacts on organizational workers' perceived performance improvement. In addition, by adopting the typology of managerial roles (Mintzberg, 1973), we investigate the moderating impact of organizational workers' dominant roles on the relationship between Smartphone use and workers' perceived performance gain. For these research purposes, we formed three research questions: 1) What are the impacts of using two different types of Smartphone functions on organizational workers' performance gain? 2) What are the impacts of internal (Smartphone dependency), task-related (task mobility) and external (perceived critical mass) factors on using the Smartphone functions? and 3) What are the moderating impact of the dominant organizational roles on the relationship between Smartphone use and perceived performance gain?

Ⅱ. Theoretical Background

2.1. The Impact of Smartphone Use and Smartphone Functions

Smartphones have been rapidly embedded into our daily lives and workplaces. Smartphone use in organizations significantly influences firms' marketing activities, consumers' behaviours, business activities, and people's daily lifestyle (Aldhaban, 2012). While Smartphones can be strategically implemented to support various business activities and thus realize firms' objectives (e.g., improving work process, increasing knowledge sharing, and enhancing sales and marketing effectiveness) (Sheng et al., 2005), a majority of prior studies on Smartphones or mobile technologies has mainly focused on users' adoption and behavioural intentions to use (Chung et al., 2014), and only handful of studies have identified and tested the positive consequence of Smartphone use in workplaces (e.g., Lee et al., 2017). Therefore, we briefly reviewed the literature on the impact of Smartphone use for workplace activities on various outcomes in organizations, and found the following insights.

First, it is found that Smartphone use can give organizations a number of benefits. Previous studies have shown that Smartphone use in workplace has a positive impact on decision-making performance (Chen et al., 2004; Lee et al., 2017), efficiency (Beurer-Zuellig and Meckel, 2008; Thakur et al., 2011), productivity (Carayannis and Clark, 2011), and employee engagement and socialization within organizations (Lee et al., 2017; Maccormick et al., 2012). For example, it is found that Smartphone use in workplace provides employees with connectivity, interactivity, and flexibility and in turn helps to enhance efficiency and effectiveness in the firm's value chain (Barnes, 2003). Bertschek and Niebel (2016) found that mobile access via smartphones in workplaces significantly increases labour productivity, and Lee et al. (2017) found that the use of informational, social networking, and resource management functions significantly influences various aspects of organizational workers' performance including decision making. A couple of studies found that employees can improve their perceived job performance and creativity through the use of mobile enterprise applications embedded in Smartphones because the applications play significant roles in facilitating the em-

ployees' work processes (Chung et al., 2015; Chung et al., 2014). Park et al. (2013) also found that the use of Smartphones' social networking services has positive effect on social capital dimensions in organizations.

Second, quite a few studies have argued and examined that Smartphone use in workplace may result in undesired outcomes such as increased stress (Grauers and Wall, 2012), task interruption (Byrd and Caldwell, 2011; Karr-Wisniewski and Lu, 2010), and work-home interference and burnout (Derks and Bakker, 2014). Indeed, we do admit that organizational workers' Smartphone use may result in negative consequences due to the nature of the device that connects anytime-and-anywhere, but the scope of this study is to look at more bright side of Smartphone use in organizations with an assumption that the device is used only for workplace activities.

Finally, to the best of our knowledge, little effort has been made so far to compare the impact of the use of different types of Smartphone functions on performance, although Smartphones provide multiple functions for various work-related activities. First, Smartphones help organizational workers manage various digital resources such as documents, photos, videos, or other types of work related resources (e.g., various apps such as file explorer, cloud storage, photo/video apps, other tools, etc.). Second, Smartphones help workers socialize with not only their friends but also with their colleagues and business partners (e.g., social media apps such as Facebook and Instagram). Third, with the help of search engines and news apps, Smartphones helps find work-related useful information better. Besides, increasing number of companies create their own mobile enterprise apps and have their employees use those smartphone apps to improve efficiency and effectiveness of workplace activities (Chung et al., 2014). While we do acknowledge that Smartphones provide various computing functions for workplace activities, however, the focus and scope of this study is not to investigate the roles of all these different types of Smartphone computing functions, but to investigate how those various computing functions in general, being compared to the communication functions that were only available by traditional mobile phones, help improve individuals' perceived performance. In sum, we acknowledge that the Smartphone is not just a telecommunication device but also a mobile computing device that provides both communication and computing functions for organizational workers. Therefore, taking more holistic view of Smartphone functions, we suggest that Smartphone functions (i.e., Apps) can be broadly classified into two types: communication functions and computing functions which include informational, social networking, and resource management functions (Lee et al., 2017). Then, we compare the impact of organizational workers' use of computing functions and communication functions for their workplace activities on their perceived performance improvement

2.2. Organizational Workers' Roles Played in Organizations

2.2.1. Managerial Roles

Managerial roles refer to a set of certain behavioural rules or responsibilities associated with an organization (Mintzberg, 1973). Using a metaphor of a play, Mintzberg (1973) argued that organizational members often perform different roles in an organization and suggested three broad types of managerial roles: 1) interpersonal, 2) informational, and 3) decisional roles. Interpersonal roles include figurehead, leader, and liaison roles; informational roles include

monitor, disseminator and spokesperson roles; and decisional roles include entrepreneur, disturbance handler, resource allocator, and negotiator roles (Mintzberg, 1973). To summarize, interpersonal roles can be considered communicating roles with people; informational roles are about gathering and processing information; and decisional roles can be considered decision making roles using information gathered and processed (Lee et al., 2017).

The managerial roles suggested by Mintzberg (1973) has been employed by many researchers to investigate the workplace activities required for managerial positions such as audit managers (Wolf, 1981), R&D managers (Pavett and Lau, 1985), intercollegiate athletic conference commissioners (Quarterman, 1994), Chief Information Officers (Grover et al., 1993), Chief Privacy Officers (Kayworth et al., 2005), to name a few. This classification was also used to identify and compare the nature of managerial roles in Asian organizations as well (e.g., Zabid, 1987). Recently, this classification was reinterpreted as managerial role performance (e.g., informational, decisional, and interpersonal role performances) and applied to the study on the relationship between the use of Smartphone functions and managerial role performance in contemporary organizations (Lee et al., 2017).

2.2.2. Contemporary Organizational Workers' Organizational Roles

In contemporary organizational environment, although an organizational member may not necessarily be a general manager of a company and may assume a lower hierarchical position than 'managers', it is often the case that a majority of organizational workers play many of the managerial roles listed above (e.g., liaison, disseminator, or negotiator roles). However, the degree to which an organizational member engages in the activities for each type of roles is far different from one another according to their job descriptions and hierarchical levels (Alexander, 1979). For example, an organizational worker, although s/he is not a manager, may devote 60% of his/her time to conduct informational roles (e.g., information search and dissemination), 15% for decisional roles, and 25% for interpersonal roles. Another organizational member, who is at the senior managerial position, may devote 50% of his/her time for decisional roles (e.g., decision making), and 30% for interpersonal roles (e.g., leadership roles), and 20% for informational roles.

Thus, we propose that any organizational member can play all the three categories of managerial roles with different degrees and these differences will influence the way s/he perceives the performance improvement from using communication and computing functions embedded in Smartphones. More specifically, this study aims to explore how these organizational roles moderate the relationship between the use of communication and computing functions of Smartphones and their perceived performance improvement.

2.3. Antecedents of the Use of Smartphone Functions

Ever since Technology Acceptance Model (Davis, 1989), IS Success Model (DeLone and McLean, 1992), and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) had been introduced in the field of Information Systems, numerous studies have investigated the factors that influence the use of various types of information systems. For a decade, we have also witnessed that many scholars have investigated the antecedents of

acceptance or use of mobile systems (applications) in various contexts (Chung et al., 2014). However, the main purpose of this study is not to review all extant studies on the antecedents of the use of Smartphones and to come up with all the possible antecedents of the use of two types of Smartphone functions. Rather, our motivation for this study is to investigate how organizational workers get to use those two distinct types of Smartphone functions (i.e., communication and computing) especially in their workplaces. Rather than thorough literature on the antecedents of technology use suggested by well-known TAM or UTAUT models that have frequently studied, we have reviewed more recent literature on the antecedents of mobile applications or systems use, and identified three antecedents more specific to the context of organizational workers' use of Smartphones in their workplaces: individuals' internal or habitual factor, task-related factor, and external factor. We believe that investigating the impact of these three antecedents of two types of Smartphone functions will advance our knowledge on the role of Smartphones in workplace. Therefore, in this study, we propose *Smartphone dependency* as an individual's internal factor, *task mobility* as a task-related factor, and *perceived critical mass in one's workplace* as an external factor for the following reasons.

First, Smartphone dependency refers to individuals' dependency on Smartphones in their day-to-day life (Tinget al., 2011). In organizational context, we define it as individuals' dependency on Smartphones for their task-related activities. It has been found that in the context of personal use of Smartphones and purchasing via Smartphones, dependency is positively associated with the user's intention to use (N. Park et al., 2013) and purchasing (Tian et al., 2009; Ting et al., 2011). Although little empirical effort has been made to investigate the role of Smartphone dependency in organizational context, we believe that it can also be an important internal factor for the use of Smartphone functions in workplaces.

Second, task mobility is defined as the extent to which individuals should move around in different locations for their job-related activities (Gebauer and Tang, 2008). The mobility of an individual worker's tasks could be seen as a similar concept with smartphone dependency because we may simply assume that those who have to move around different locations for their works may rely more on Smartphones for their tasks. However, there is ample anecdotal evidence that the workers who have to move around often do not rely much on mobile devices (e.g., a civil engineering worker who is on move all the time never touches her/his Smartphone for work-related activities) and those who spend most of the time in their workplaces rely heavily on their Smartphones for their tasks. The correlation between task mobility and smartphone dependency (0.205) shown in <Table 2> also shows that these two antecedents are distinct from each other. It is found that an individual's mobility is an important antecedent of the use of the variety of mobile services. For example, in the context of Smartphones use for hedonic and transactional purposes, an individual's mobility has a positive impact on his/her use of mobile ticketing services (Mallat et al., 2009) and his/her adoption of mobile payment systems (Schierz et al., 2010) and mobile banking systems (Zhou et al., 2010). Thus, we believe that in organizational context, it will be worthwhile to investigate the impact of an individual's mobility on her/his task-related use of Smartphone functions.

Finally, perceived critical mass (PCM) of Smartphones use is defined as the extent to which a person believes that most of his/ her peers are

using Smartphones (Lou et al., 2000). The theory of network externalities asserts that people's PCM can be formed with their perceived network externalities of a certain technology and this PCM can influence acceptance of a technology (Hsu and Lu, 2004; Kauffman et al., 2000). Several recent studies also found that PCM has a positive impact on the use of or intention to use technologies. For examples, Van Slyke and his colleagues (2007) found that PCM is positively associated with intention to use communication technologies. It is also found that PCM is positively associated with online game acceptance (Hsu and Lu, 2004). Thus, we propose that PCM is an important external factor that may lead to the use of Smartphone functions in workplaces.

Ⅲ. Research Model and Hypotheses

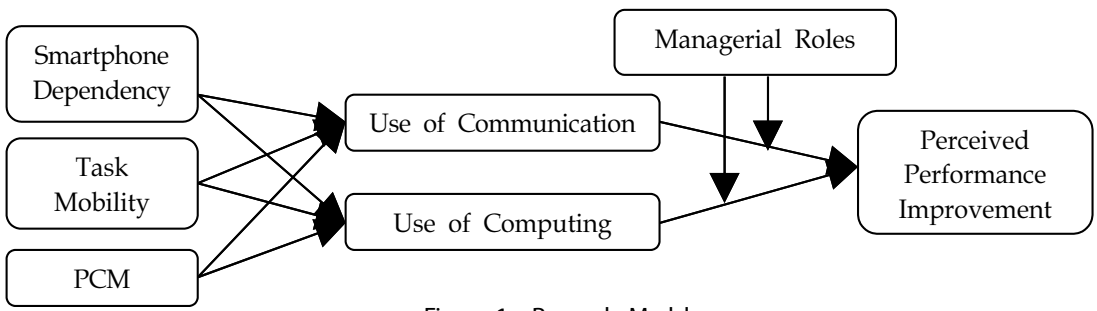
Based on the extant research on Smartphone use in organizations and organizational roles, we develop a research model that hypothesizes the relationships among Smartphone dependency, task mobility, PCM of Smartphone use, the frequency of using communication and computing functions, managerial roles, and perceived performance improvement. Our research model is depicted in <Figure 1>.

3.1. The Impact of Smartphone Dependency, Task Mobility and PCM

Smartphone dependency has a positive association with actual use of Smartphones in the context of mobile wireless services (Kim, 2008) and a positive impact on future purchasing behaviour of Smartphones (Ting et al., 2011). In the context of individuals' Smartphone use in an organization, their dependency on Smartphones will have positive influence on the use of both communication and computing functions, as these functions has become essential functions for organizational workers nowadays. Therefore, when an individual is strongly dependent on the Smartphone for her/his work-related tasks, s/he will tend to communicate more frequently with their co-workers or people outside his/her organization using communication functions, socialize with them using SNS functions, search task-related information using informational functions (e.g., mobile web-browser or RSS feeders), and manage his/her task-related documents (e.g., time-scheduler, and document editor/viewer) using resource management functions. Therefore, we hypothesize that;

H1a: Smartphone dependency is positively associated with using communication functions in Smartphones.

H1b: Smartphone dependency is positively associated with using computing functions in Smartphones.



<Figure 1> Research Model

In the context of mobile enterprise systems embedded in Smartphones, individuals' mobility and their independency of location has been found important factors for perceived usefulness and perceived task-technology fit of Smartphone applications (Chung et al., 2014). It is also found that the mobility influences the habitual use of Smartphones (Chung et al., 2015). As such, when an individual worker's task mobility is high, so that they need to be re-located to fulfil their tasks, they will need to access various communication and computing functions with Smartphones more often than with non-mobile workers who can have easy access to fixed communication and computing systems (e.g., fixed phones and PCs). Therefore, we hypothesize that;

H2a: Task mobility is positively associated with using communication functions in Smartphones.

H2b: Task mobility is positively associated with using computing functions in Smartphones.

If one perceives that the majority of members of her/his organization are using various communication functions (e.g., mobile chatting, email, voice, and video conferencing) and computing solutions (e.g., information searching, social networking, and resource management), then s/he might feel s/he also need to use those computing and communication functions. For example, if one finds the rest of his/her team members are connected and communicated with each other using a certain chatting application (e.g., WhatsApp or Line) or SNS (e.g., LinkedIn), s/he may strongly feel to be left isolated thus will want to join them by signing in and using the same application. Similarly, if s/he finds that the majority of members of her/his organization get the newsfeeds from industry-related news sites (e.g., CNN money or Techcrunch.com) to gather useful information and sometimes forward it to others, s/he will tend to subscribe the same or similar sites by using informational functions. Finally, PCM is also found to be one of the important factors for the acceptance of mobile-enabled resource management services (e.g., mobile enterprise system) (Chung et al., 2015). Therefore, we hypothesize that;

H3a: Perceived critical mass of Smartphone use is positively associated with using communication functions in Smartphones.

H3b: Perceived critical mass of Smartphone use is positively associated with using computing functions in Smartphones.

3.2. The Impact of Using Communication and Computing Functions on Perceived Performance Improvement

As shown in the literature review on the impact of Smartphone use, there are many positive aspects in Smartphone use for organizational workers. First of all, various communication functions in Smartphones, which include both voice communication tools (traditional cellular phone function) and other communication apps such as mobile-email apps, video chatting apps (e.g., Facetime), free chatting apps (e.g., WhatsApp or LINE), have been found positively associated with the efficiency in communication and collaboration among organizational workers (Beurer-Zuellig and Meckel, 2008; Lo et al., 2012).

Second, among computing functions, there are quite a few useful applications that may help improve task performance of organizational workers. Social networking apps, for example, are reported to be positively associated with employee productivity. A study conducted by AT&T with its 2,500 employees in five European countries showed that using SNS

helps employees' perceived performance because SNS helps them to gain knowledge about their tasks, markets and customers, to collect creative ideas, and to provide team-building opportunities (Aguenza and Som, 2012). Also, a proper use of SNS helps organizational members in finding new business opportunities (Wilson, 2009).

Other than SNS, informational functions also help employees access to useful information sources anytime-and-anywhere. Having access to useful information on mobile hand-held devices satisfies informational needs of organizational workers, thus it improves the efficiency in decision making (Chen et al., 2004). In the field of medical informatics, for example, it is found that anytime-and-anywhere access to patient information improves the perceived quality of patient care services (Choi et al., 2011). As such, immediate access to useful information will positively influence many aspects of organizational workers' performance improvement.

Finally, resource management tools embedded in Smartphones, such as mobile office apps, schedulers and calendar, and other productivity tools, such as enterprise systems, will also have positive influences on organizational workers' perceived performance gain. For example, document viewer and editor apps embedded in Smartphones help improve mobile workers' efficiency by providing them with ability to manage documents delivered to them when they are away from their fixed PCs. Also, cloud storage systems, such as Dropbox and Google Drive, provide a worker with access to up-to-dated documents produced by her/his co-workers while s/he is away from her/his office. Research also found that organizational resource management systems such as enterprise mobile applications positively influence employees' perceived performances gain (Chung et al., 2015).

In sum, we argue that the use of communication and computing functions (informational, social networking, and resource management) will be positively associated with the performance gain perceived by workers. Therefore, we hypothesize the following hypotheses.

H4a: The use of communication functions in Smartphones is positively associated with perceived performance improvement from Smartphone use.

H4b: The use of computing functions in Smartphones is positively associated with perceived performance improvement from Smartphone use.

3.3. The Moderating Impact of dOminant Organizational Roles on the Impact of Smart-computing Functions on Individual Performance

To the best of our knowledge, little empirical effort has been made so far to investigate the moderating role of organizational roles on the relationship between mobile technology use and individual performance. In this section, we propose that the extent of organizational role-playing moderates the impact of communicating or computing functions on an individual's perceived performance. Since the tasks of an individual are closely related to the roles s/he plays in an organization, we apply the theoretical perspectives from the studies on the moderating impact of task characteristics on individual performance to propose a number of hypotheses with regard to the moderating impact of organizational roles on the relationship between Smartphone use and an individual's perceived performance improvement.

Since the theory of task-technology fit (TTF) was proposed (Goodhue and Thompson, 1995), numerous studies have argued and tested the relationship between TTF and individual performance, some of

which focused on the moderating impact of task characteristics on the relationship between mobile technology use and an individual's performance. For example, Chung et al. (2014) found that task significance moderates the relationship between the use of enterprise mobile applications and individuals' performance gain (Brooks, 2015). In a similar vein, the performance impact of technology use can be contingent on the roles of an individual in her/his organization. Therefore, in this study, we theorize that individuals' perception that a certain information technology helps improve their performance will be contingent on an individual's dominant roles s/he play in her/his organization. In brief, we propose that the extent of *decisional and interpersonal* role playing moderates the relationship between the use of both communication and computing function and an individuals' perceived performance improvement. We discuss the reason why we did not include informational roles as moderating factor in the discussion section.

First, individuals who often play decisional roles in their organizations will need instant access to various information and resources for more effective decision making. If an organizational worker dominantly plays decisional roles in her/his organization, s/he will perceive that his/her use of Smartphones improve his/her performance more than those who do not play decisional roles in their organizations because the communication and computing (informational, social networking, and resource management) functions in Smartphones provide her/him with instant access to various communication channels (voice, text, and data communication tools), information sources (e.g., mobile web-browsers, news apps, and information feeds in SNS) and anytime-and-anywhere access to internal resources of her/his organization (through resource management functions such as cloud file sharing systems). Research also suggests that 'anytime-and-anywhere' access to up-to-date information and resources with mobile devices, in general, helps overall decision-making performance (Chen et al., 2004; Wong et al., 2015). Therefore, we hypothesize that the relationship between the use of communication or computing functions and individual's perceived performance improvement from Smartphone use will be stronger when the degree to which an individual plays decisional roles is higher.

H5a: The extent of decisional role playing in an organization positively moderates the relationship between the use of communication functions and perceived performance improvement from Smartphone use.

H5b: The extent of decisional role playing in an organization positively moderates the relationship between the use of computing functions and perceived performance improvement from Smartphone use.

Second, organizational workers who dominantly play interpersonal roles engage in motivating their co-workers, becoming representative of their firms, and playing the role of the liaison for other members of organization (Mintzberg, 1971). Thus, they will appreciate the fact that Smartphones provide instant access to communication channels and computing functions. For instances, anytime-and-anywhere access to communication channels and social network functions in Smartphones help them interact with their social networks more conveniently and help them build beneficial social capital, which eventually help improve their interpersonal relationships within their organizations and even across different organizations (Steinfield et al., 2008). Also, up-to-date information supported by information sources in Smartphones (e.g., news feed, mobile web-search,

etc.) (Pentina and Tarafdar, 2014) and ability to forward various task-related information to their personal networks using their contact list stored in their Smartphones (a part of resource management systems) will have the workers perceive that their Smartphones improve their performance in informing and motivating their co-workers. In sum, for individuals who play interpersonal roles dominantly, the use of communication and computing functions, by allowing them to maintain social relationship with their peers and other members from different organizations (Treem and Leonardi, 2013) and to have access to various information anytime-and-anywhere, will be perceived important and helpful for their performance. Therefore, we hypothesize that the relationship between the use of communication and computing functions in Smartphones and individual's perceived performance improvement will be stronger when the degree to which an individual plays her/his interpersonal roles is higher.

H6a: The extent of interpersonal role playing in an organization positively moderates the relationship between the use of communication functions and perceived performance improvement from Smartphone use.

H6b: The extent of interpersonal role playing in an organization positively moderates the relationship between the use of computing functions and perceived performance improvement from Smartphone use.

Ⅳ. Methodology

4.1. Sample and Survey

The target population of this study is organizational workers who use Smartphones for their workplace activities more than six months. Respondents were solicited by an advertisement for the online survey for one month. Among the 358 respondents who had started to answer the questionnaire, 205 completed the survey, from which 20 were screened out from our sample because they answered "no" to the screening question: "Have you used a Smartphone for your workplace activities for at least 6 months?" By using this screening question, only participants who had used their Smartphones for 6 months or more for their workplace activities were included in our data analysis. As a result, we have a final sample size of 176, with a completion rate of 49.16%. Of the sample, 22.7% were women, 96.6% possessed university or graduate school degrees, and 84.1% were between 25 and 44 years old. <Appendix 1> shows the details of demographic characteristics of respondents.

4.2. Measurement

We either modified extant measures to fit them into our research context or developed new items when we could not find suitable extant measures. After we made our first draft of items, we reviewed it for face validity of items. Necessary changes were made based on face validity test. Items were measured with seven-point Likert scales, with item responses ranging from 1 = "do not use it at all" to 7 = "use it all the time" for the frequency of each types of Smartphone functions, or from 1 = "strongly disagree" to 7 = "strongly agree" for the remaining items.

We took the items for *performance improvement from Smartphone use* from an extant study (Igbaria and Tan, 1997). Based on these items, we examined individuals' perceived job performance improvement from Smartphone use, by measuring improvement in 1) overall performance, 2) task effectiveness, and

3) productivity in task fulfilment since they had used Smartphones for their workplace activities. We modified the items for *task mobility* and *PCM* based on Chung et al. (2014) and modified the items for *Smartphone dependency* based on Ting et al. (2011). Finally, we adapted the items for *the frequency of Smartphone function use* from Lee et al. (2017), and developed the items for *dominant organizational roles* based on various theoretical perspectives in extant studies (Mintzberg, 1973; Tengblad, 2006). The full survey items are listed in <Appendix 2>. In order to check whether the impact of Smartphone use on overall performance improvement is significant, we added education level, gender, hierarchical position, industry, functional roles, and work experience for control variables.

V. Result

We adopted Partial Least Squares (PLS) analysis (Chin, 1998) with Smart PLS (Ringle et al., 2005) for both the measurement and structural model analysis, since PLS is an appropriate statistical analysis tool for the study of a multi-path model with non-normal data (Hair Jr et al., 2016), as is the case for this study.

5.1. Testing for the Measurement Model

We assessed the reliability and validity of the measurement model with the latent variables that are reflectively measured by more than one items, based on internal consistency and confirmatory factor analysis (CFA). <Table 1> shows the properties of the measurement items. First, the smallest value of Cronbach's α was 0.70, indicating satisfactory levels of internal reliability. Second, for convergent validity, item loadings exceeded the threshold of 0.7 (Hair et al., 2005). Third, the composite reliability (CR) of all latent variables exceeded the recommended threshold of 0.7, and the average variance extracted (AVE) for each construct exceeded 0.5 (Fornell and Larcker, 1981).

Lastly, <Table 2> shows the inter-construct correlations, with the square roots of the AVE of the eight constructs that are measured reflectively with multiple items (bold numbers) in the diagonal elements. Since the square roots of the AVE exceeded the inter-construct correlations, the discriminant validity is satisfied (Chin et al., 1997).

5.2. Testing for the Common Method Bias

It is widely reported that all self-reported survey data have a potential for common method biases due to consistency motif and/or social desirability (Podsakoff et al., 2003). Following prior studies (Liang et al., 2007; Podsakoff et al., 2003), we conducted a statistical analysis to evaluate the severity of common method biases by employing the single-method factor approach.

We created a common method factor in the PLS model by including all the principal constructs' indicators of latent variables that are measured with more than one items (Liang et al., 2007). Then each indicator's variances substantively explained by the principal constructs and by the method construct were calculated. As shown in <Table 3>, the results demonstrate that the average substantively explained variance of the indicators ($R1^2$) is .735, while the average method-based variance ($R2^2$) is .011. The ratio of substantive variance to method variance is about 67:1 and most method factor loadings are not significant. Therefore, we contend that common method bias is not likely to be a serious concern for this study.

<Table 1> Scale Reliabilities and Convergent Validity

Construct	Cronbach's α	Composite Rel.	Avg. Var. Extracted	Item	Factor Loadings
Perceived Performance Improvement	0.87	0.92	0.79	Perform1	0.9321
				Perform2	0.9528
				Perform3	0.7760
Decisional Roles	0.87	0.91	0.72	DCroles1	0.8888
				DCroles2	0.8372
				DCroles3	0.8378
				DCroles4	0.8225
Interpersonal Roles	0.74	0.85	0.66	IProles1	0.7583
				IProles2	0.8372
				IProles3	0.8331
Use of Computing Functions	0.70	0.83	0.62	UseSmart1	0.8565
				UseSmart2	0.7397
				UseSmart3	0.7670
Smartphone Dependency	0.90	0.95	0.91	Depend1	0.9551
				Depend2	0.9561
Task Mobility	0.72	0.84	0.63	TMobility1	0.8009
				TMobility2	0.7997
				TMobility3	0.7883
PCM	0.83	0.90	0.75	PCM1	0.9209
				PCM2	0.9364
				PCM3	0.7227

<Table 2> Correlation Matrix and Discriminant Assessment

	1	2	3	4	5	6	7	8
1. Perceived Performance	**0.891**							
2. Decisional Roles	0.479	**0.847**						
3. Interpersonal Roles	0.47	0.638	**0.81**					
4. Use_Comm	0.531	0.42	0.386	**1**				
5. Use_Computing	0.592	0.46	0.45	0.569	**0.789**			
6. Dependency	0.32	0.349	0.351	0.191	0.242	**0.956**		
7. Mobility	0.353	0.448	0.517	0.314	0.461	0.205	**0.796**	
8. PCM	0.451	0.375	0.274	0.479	0.431	0.284	0.352	**0.865**

5.3. Testing for the Structured Model

We tested the hypothesized relationships on the basis of the explained variance (R^2) of the dependent and mediating variables, path coefficients (β), and their level of significance obtained from a boot-

<Table 3> Common Method Bias Analysis

Construct	Indicators	Substantive Factor Loading (R1)	$R1^2$	Method Factor Loading (R2)	$R2^2$
Perceived Performance Improvement	Perform1	0.880**	0.774	0.052	0.003
	Perform2	0.871**	0.759	0.095*	0.009
	Perform3	0.935**	0.874	-0.171	0.029
Decisional Roles	DCroles1	0.794**	0.63	0.1	0.01
	DCroles2	0.767**	0.588	0.067	0.004
	DCroles3	0.956**	0.914	-0.13	0.017
	DCroles4	0.875**	0.766	-0.038	0.001
Interpersonal Roles	IProles1	0.851**	0.724	0.096	0.009
	IProles2	0.768**	0.59	0.083	0.007
	IProles3	0.816**	0.666	0.007	0
Use of Smart-computing Functions	UseSmart1	0.781**	0.61	0.081	0.007
	UseSmart2	0.848**	0.719	-0.097	0.009
	UseSmart3	0.744**	0.554	0.009	0
Dependency	Depend1	1.048**	1.098	0.253**	0.064
	Depend2	0.991**	0.982	-0.155**	0.024
Mobility	TMobility1	0.854**	0.729	-0.019	0
	TMobility2	0.863**	0.745	-0.039	0.002
	TMobility3	0.668**	0.446	0.069	0.005
PCM	PCM1	0.870**	0.757	0.066	0.004
	PCM2	0.896**	0.803	0.053	0.003
	PCM3	0.837**	0.701	-0.148	0.022
Average			0.735		0.011

note: $^{**}p < .01$, $^{*}p < .05$

strapping re-sampling method (380 re-samples) (Chin, 1998). <Table 4> presents the structural path-coefficient estimates on each path with explained variances (R^2).

First, dependency is positively associated with the use of computing functions (H1b: β=0.091, t=1.667, α=0.10), while the relationship between dependency and the use of communication functions is not significant (H1a is not supported). Task mobility is positively associated with the use of communication functions (H2a: β=0.161, t= .174, α=0.05) and the use of computing functions (H2b: β= .342, t=4.659, α=0.01) also. In addition, PCM is positively associated with the use of communication functions (H3a: β=0.410, t=5.340, α=0.01) and the use of computing functions (H3b: β=0.285, t=3.559, α=0.01). The results of H1, H2, and H3 indicate that organizational workers tend to use computing functions in Smartphones when they depend on Smartphones for their task-related activities, need to move around different locations to fulfill their tasks, and perceive that the majority of work-related colleagues use

<Table 4> Hypothesis Testing Result

Direct Effect	Path Coefficient	*t*-value	Hypothesis Testing
Dependency → Use_Comm (H1a)	0.041	0.558	Not supported
Dependency → Use_Computing (H1b)	0.091	1.667*	Supported
Mobility → Use_Comm (H2a)	0.161	2.174**	Supported
Mobility → Use_Computing (H2b)	0.342	4.659***	Supported
PCM → Use_Comm (H3a)	0.410	5.340***	Supported
PCM → Use_Computing (H3b)	0.285	3.559***	Supported
Use_Comm → Perceived performance improvement (H4a)	0.280	4.013***	Supported
Use_Computing → Perceived performance improvement (H4b)	0.432	6.909***	Supported
Moderation effect	Effect Size	t-value	Hypothesis Testing
Use_Comm × Decisional Roles → Perceived performance improvement (H5a)	0.4%	0.776	Not supported
Use_Computing × Decisional Roles → Perceived performance improvement (H5b)	2.2%	2.137**	Supported
Use_Comm × Interpersonal Roles → Perceived performance improvement (H6a)	0.7%	1.289	Not supported
Use_Computing × Interpersonal Roles → Perceived performance improvement (H6b)	1.5%	1.874*	Supported

note: R^2 for perceived performance improvement = 0.43

R^2 for Use_Comm = 0.26

R^2 for Use Computing = 0.30; $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$

Smartphones. However, dependency on Smartphones does not significantly affect the use of communication functions, while organizational workers use communication functions when they are frequently relocated for their tasks and perceive their majority of peers use Smartphones. We will discuss the implication of our findings in our discussion section.

Second, for H4a and H4b, as hypothesized, using communication functions is positively associated with perceived performance improvement (H4a: β =0.280, t=4.013, α=0.01). In addition, using computing functions is positively associated with perceived performance improvement (H4b: β=0.432, t=6.909, α=0.01). These results indicate that using both types of Smartphone functions at workplaces has a positive effect on employees' perceived performance improvement, while the impact of computing functions on perceived performance improvement is stronger than that of communication functions.

Finally, in order to test H5 and H6, we measure both t-statistics of interaction factors and effect size. The effect size of this moderation impact is calculated by following Chin et al. 2003. As a result, H5b was supported at the α = 0.05 level with an effect size of 2.2 %, which is a moderate-to-small moderation effect (Henseler and Fassott, 2010), while H5a was not supported. We can interpret this result that when individuals play decisional roles dominantly, the impact of the use of computing functions on their perceived performance improvement will become stronger. In addition, although H6a was not supported, H6b was supported at the α = 0.1 level with

a weak but not negligible effect size of 1.5%. However, this low effect size does not necessarily imply that the underlying moderating effect is negligible if the resulting beta changes are meaningful and the t-statistics of interaction term is significant (Chin et al., 2003, p. 211). Thus, we can interpret this result that when individuals play interpersonal roles, the impact of the use of Smart-computing functions on perceived performance improvement will be stronger. Overall, approximately 43% of the variance in the perceived performance improvement was explained by our research model.

Ⅵ. Discussion

6.1. Implications for Theory

The key objectives of this study are to investigate whether the use of communication and computing functions is positively associated with individual's perception that Smartphones improved their task performance and to examine whether the relationship between the use of communication and computing functions of Smartphones and perceived performance improvement is moderated by the extent to which individuals play decisional and interpersonal roles. In addition, this study aims to identify and test the impact of three salient antecedents on the use of the two kinds of Smartphone functions. The empirical results of this study contribute to theory in several ways.

First, the significant and positive relationship between the use of Smartphone functions and perceived performance improvement implies that organizational workers indeed perceive that Smartphones are beneficial for their tasks in workplaces. Also, the results show that organizational workers perceive that computing functions have stronger impact on their performance improvement than communication functions do, which highlights the importance of Smartphones as mobile computing devices for contemporary workplace activities. This finding contributes to the body of knowledge on the role of mobile computing technologies in contemporary organization. Thus, future research may take our theoretical perspective that a Smartphone is rather a mobile computing device than a simple communication device, and examine its role as mobile computing solutions for various organizations.

Second, the significant moderating impact of organizational workers' managerial roles (decisional and interpersonal) on the relationships between the use of Smartphones' computing functions and perceived performance provides evidence that the impact of Smartphone use is different according to worker's roles they play in organizations and highlights the suitability (or fit) between organizational workers' roles and specific computing functions. Our findings suggest that, in future studies, individuals' work-related variables (roles, tasks, etc.) are important to consider when discussing the impact of mobile computing devices or mobile application on any performance measure.

Third, this study shows differential impacts of three antecedents on the two types of Smartphone functions. These findings provide evidence that users' technology acceptance for different sub-functions (communication vs. computing) of the same technology (Smartphones) depends on individuals' internal traits (e.g., technology dependency), their tasks (e.g., task mobility), and external forces (e.g., critical mass). We believe that these findings contribute to the body of knowledge on the factors for technology acceptance in the context of mobile computing and communication technologies. Future studies on the technology

acceptance of mobile devices can build on three proposed categories of factors related to Smartphone use (i.e., internal traits, task-related factors, and external forces) to further develop the antecedents of different types of mobile computing functions (e.g., informational, resource management functions, etc.) (Lee et al., 2017).

6.2. Implications for Practice

The current study provides significant implications for contemporary organizational workers and managers. First, nowadays we can encounter quite a few cases where organizational workers rely on Smartphones for their workplace activities. One of recent examples of Smartphone use for workplace activities is the case of Netflix CEO, who relies heavily on Smartphones for his most workplace activities without even using PCs (McAlone, 2017). The findings of this study provide statistical evidence of a positive aspect of using Smartphones in workplaces, whereas many studies have recently discussed the problems of using Smartphones in workplaces such as work-home interference, stress, and burnout (Derks et al., 2015). Conversely, we showed that organizational workers actually appreciate mobile computing functions provided by Smartphones in their workplace activities. The result of this study also shows that the effect of those computing functions on workers' performance actually depends on workers' roles they play in their organizations. Specifically, our findings suggest that while both computing and communication functions are positively associated with organizational workers' perceived performance improvement and that the relationship between computing functions and perceived performance is stronger than the relationship between communication functions and perceived performance. Therefore, practitioners should admit that the Smartphone is now an important computing tool (on top of its traditional functions for communications) that supports individual workers' organizational activities in various ways.

Second, the significant moderating effect of decisional and interpersonal roles on the relationship between the use of mobile computing functions and perceived performance implies that organizational members those who tend to play decision making and interpersonal roles rely especially on computing functions of Smartphones for their workplace activities and also appreciate the positive impact of mobile computing functions for their workplace activities regarding decision making and socializing with others. Nowadays we have noticed quite a few anecdotal evidences that organizational workers make their decisions using information and tools provided by Smartphones or get socially connected with their co-workers, business partners, and customers. This study, therefore, reaffirms that those who are often involved in decision making and socializing with others in their works get significant benefits from the computing functions embedded in Smartphones. We suggest that rather than simply banning the use of smartphones in workplaces because of its negative effects suggested by research, general managers should provide their employees with a guideline that explains how to properly use the device to support their organizational roles.

Third, the significant effects of internal (Smartphone dependency), task-related (task mobility), and external (PCM) factors on the use of both computing and communication functions of Smartphones provide us with interesting insights. To summarize, Smartphone dependency and task mobility have stronger relationship with computing functions than with communication functions, while PCM is more

strongly related with communication functions than with computing functions. These findings show that organizational workers who are more dependent on Smartphones and has the tasks that they can do without staying in a fixed office tend to rely more on computing functions than communication functions, while those who perceive that more number of co-workers also use Smartphones for workplace activities tend to rely more on communication functions than computing functions. In any case, these results again highlight the need of smartphones for contemporary organizational workers who are dependent on their smartphones, work while moving, virtually or under no-office environment (E.g., digital nomad) (Nummi et al., 1998), and are surrounded by co-workers who are also using mobile computing devices.

6.3. Limitations and Future Research Suggestions

This study has several limitations and provides certain directions for future research. First, as we mentioned, there is a possibility of other influencing factors for both communication and computing functions. Future studies should use our three categories (users' personal traits, external factors, and task characteristics) of the antecedents of the use of different smartphone functions in workplaces.

Second, we did not add the moderating impact of 'informational roles' from Mintzberg's managerial role categories (1973) but include only decisional and interpersonal roles in our model as moderating factors for the relationships between the use of Smartphone functions and perceived performance improvement, for the following reasons. Informational roles include monitoring externally sourced information, disseminating information within and across organizations, and transmitting the information (Mintzberg, 1971). These roles entail more complex gathering, analysing, retrieving and disseminating activities of informational with more convenient user interfaces than mobile devices, which provides only limited input and output user interfaces (i.e., smaller keypad and screen) (Gafni, 2008). Therefore, we assumed that the moderating role of informational roles on the relationship between the use of computing functions and their performance gain may not be significant since those who play informational roles dominantly will rely more on fixed and larger computing and communication equipment (e.g., gathering and disseminating information with rather bigger screens, and liaison roles with more detailed e-mail contents using PCs). As a result, the benefit of anytime-and-anywhere access to information sources for their tasks may not be significantly stronger for those who play informational roles dominantly. Therefore, we argue that the relationship between the use of computing functions and individual's perceived performance gain will not be significant when the degree to which an individual plays informational roles is higher.

Third, although we highlighted only positive aspect of Smartphone use in workplace, it will be worthwhile to empirically validate both of bright and dark sides of Smartphone use in workplace. In future studies, by applying both performance improvement and workplace disturbance, we may better understand different roles of Smartphones in workplace.

Finally, since this study collected data with cross-sectional and self-reported survey method, our argument with findings on the relationships among the variables should be interpreted as correlations or associations rather than causality. Also, due to the self-reported performance measures, our statistical analysis could create a self-serving bias, although we tried to overcome this concern with com-

mon method bias analysis. However, in future studies, it is desired to conduct with more objective measures of individual performance, possibly with a longitudinal approach.

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<Appendix 1> Demographics of Survey Respondents

Gender	Frequency	Percent
Female	40	22.7
Male	136	77.3
Total	176	100.0

Age Groups	Frequency	Percent
~25	1	.6
25~29	11	6.3
30~34	31	17.6
35~39	52	29.5
40~44	54	30.7
45~49	19	10.8
50~	8	4.5
Total	176	100.0

Industry	Frequency	Percent
Manufacturing	30	17.0
Service	17	9.7
Medicine	7	4.0
Distribution	3	1.7
Public sector	13	7.4
InformationTech.	63	35.8
Finance	14	8.0
Education	14	8.0
Etc.	15	8.5
Total	176	100.0

Education	Frequency	Percent
High School	1	.6
Trade School	1	.6
College	4	2.3
University	94	53.4
Graduate School	76	43.2
Total	176	100.0

Work Experience	Frequency	Percent
~2yrs	12	6.8
3~5yrs	23	13.1
6~10yrs	42	23.9
11~15yrs	55	31.3
16~20yrs	32	18.2
21~yrs	12	6.8
Total	176	100.0

Hierarchical Positions	Frequency	Percent
Entry level manager	26	14.8
Assistant Manager	21	11.9
Manager	26	14.8
Vice Senior Manager	30	17.0
Senior Manager	24	13.6
Executive	19	10.8
CEO	13	7.4
Etc.	17	9.7
Total	176	100.0

<Appendix 2> Measurement Items

1) Smartphone Dependency (Ting et al., 2011)
- I cannot do anything with my job without my smartphone.
- I'm totally dependent on my smartphone in my workplace.

2) Task Mobility (Chung et al., 2014)
- I have to move frequently to my job.
- I spend more time outside of the company than the office.
- My job is uninhibited for space.

3) Perceived critical mass of Smartphone usage (Chung et al., 2014)
- Most colleagues in my company frequently use Smartphones for workplace collaboration.
- Most colleagues in my company usually use Smartphone for their tasks.
- I think that most colleagues in my company use Smartphones.

4) Smartphone use frequency (Developed): Please indicate the extent to which you use each of the following functions of your Smartphone for your work-related activities (1 = "do not use it at all" ~ 7 = "use it all the time")
- Communication-related functions (Email, SMS, MMS, voice/video phones,,..)
- Information-sharing functions (news, search, maps, other info providing apps,..)
- Socializing (Social Network) functions (social networking apps: Facebook, LinkedIn, Twitter,..)
- Resource management functions (Office SW, Memo, Scheduler, PDA functions…)

5) Overall performance improvement from Smartphone use (Igbaria & Tan, 1997)
- My Smartphone helps me improve my performance in my workplace.
- I can perform my tasks effectively with my Smartphone.
- My Smartphone helps me improve my productivity by reducing the lead time of my tasks.

6) Dominant Managerial Roles – Interpersonal roles (a. ~ c.) and Decisional roles (d. ~ g.)
Please indicate the percentage of the time used for each of the following roles that you play for your tasks in your company since the time you have worked in your company.
- Representing the company as performing ceremonial and symbolic jobs _____%
- Interacting with subordinates, and to direct and motivate employees _____%
- Developing and maintaining a network of external contacts _____%
- Initiating innovations and changes in the company _____%
- Dealing with unexpected events and operational breakdowns _____%
- Controlling the use of the company's physical, financial, and human resources _____%
- Participating in negotiation activities with other organizations and individuals _____%