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Innovative IT Use and Innovating with IT: A Study of the Motivational Antecedents of Two Different Types of Innovative Behaviors

Yasser Rahrovani
Ivey Business School, Western University

Alain Pinsonneault
Desautels Faculty of Management, McGill University

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Yasser Rahrovani
Ivey Business School
University of Western Ontario
yrahrovani@ivey.ca

Alain Pinsonneault
Desautels Faculty of Management
McGill University
alain.pinsonneault@mcgill.ca

Abstract: The paper distinguishes two different types of innovative behaviors with information technology (IT): innovative IS use (IU) and innovating with IT (IwIT). While the former focuses on changing the technology and the work process to better support one's existing work goals, the latter focuses on using IT to develop new work-related goals and outcomes. Drawing on Parker's theory of proactive behavior, the paper compares the motivational antecedents and consequences of these two innovative behaviors with IT. Our model hypothesizes that three generic types of motivation differentially affect IwIT vs. IU. The paper also explores the moderating role of slack resources on the effect of motivation on the two innovative behaviors with IT. Data from a survey of 427 IT users from North American companies show that social motivation affects IwIT (but not IU); intrinsic motivation is positively related to IU (but not IwIT), and internalized extrinsic motivation affects both IU and IwIT. Further, the results indicate that the moderating role of slack resources on different motivational paths is not a one-size-fits-all effect, that is, IS slack resources only moderates the relationship between intrinsic motivation and IwIT. We also differentiated the consequences of IwIT from IU. The post hoc analysis shows that IwIT is significantly related to individual mindfulness at work, but IU is not. The paper contributes to IS research by offering a rich conceptualization of IwIT and examining its motivational antecedents and consequences, compared to IU.

Keywords: innovating with IT, innovative IS use, user innovation, innovative behavior, motivation, slack resources

Introduction

In order to compete in an environment characterized by fast technological advances and increasing competition, managers expect employees not only to perform their assigned tasks but also to anticipate trends and needs and accordingly, spearhead changes in the nature of their work (Anderson Jr. et al. 2014; Grant and Parker 2009; Parker et al. 2019). This requires employees to innovate by changing their work goals and outcomes, such as their work deliverables or the method used to deliver them. At the same time, employees expect that organizations will provide them with adequate autonomy and support so that they can engage in changing their work to be well-aligned with their preferences, motivations, and capabilities (Rousseau et al. 2006; Wu et al. 2018). These changes have increasingly made employees active participants in work design rather than passive recipients of it (Grant and Parker 2009).

However, despite the significant role of IT in empowering employees to innovate in their work, information systems (IS) research on the innovative use of technology has mainly examined how users creatively change their use of IT to better support their *existing work goals* (e.g., Hsieh and Wang 2007; Kim and Gupta 2014; Li et al. 2013). We call this *innovative IS use*, or IU. However, IT provides occasions for individuals to *create new work goals and outcomes* (e.g., develop new work deliverables and/or new methods to make deliverables accessible to beneficiaries)—which we call *innovating with IT* (IwIT). The present paper differentiates these two types of proactive IT-related behaviors based on the focal point of novelty (in IT use or in the work) and the goals of making changes (to better attain existing work goals or to change the work goals).

Not distinguishing between IU with IwIT can hinder a deep understanding and analysis of the antecedents, consequences, and processes involved in innovative behaviors with

IT. In fact, the empirical evidence shows that the relationship between different types of motivation and innovative behaviors with technology—that have conceptually mixed IU and IwIT—is inconclusive. Some evidence indicates that intrinsic motivation (Li et al. 2013) and internalized extrinsic motivation (Wang et al. 2011) foster innovative use while others found no significant relationship between intrinsic motivation (Kankanhalli et al. 2015), internalized extrinsic motivation (Li et al. 2013), and innovative use of technology. Distinguishing between IU and IwIT and understanding their motivational antecedents is important because they can be the source of different types of benefits and risks in organizations. First, with respect to benefits, while IU focuses on process innovations within one's existing work structure, IwIT involves outcome innovations that aim to affect the deliverables of one's work. Therefore, IwIT directly affects others and can make innovating employees more mindful in their work and work context. For example, Google argues that more than half of its new products and services originate from employee outcome innovations (Mayer 2006; 11:15-11:48). Second, it has been argued that proactive behaviors that engage with others (such as IwIT) not only contribute to individual effectiveness but also to the effectiveness of other work colleagues around them (Griffin et al, 2007). This may lead to radical innovations at the periphery of one's work as new work outcomes are developed. Third, with respect to risk, the flip side of engaging with radical innovations is that IwIT is also riskier and has broader impacts and spillover effects on other individuals and groups (Grant et al, 2009; Bindl and Parker 2010). The riskier nature of IwIT suggests that slack resources—i.e., extra resources beyond what is required to accomplish one's job—might affect IU differently than IwIT. Further, not differentiating IU and IwIT hinders our ability to guide practice and help managers to mindfully motivate distinct types of innovative behavior with IT.

The paper draws on Parker's model of proactive motivation (Parker et al. 2006, 2010) to compare and contrast different motivational antecedents of IU vs. IwIT. The choice of Parker's model is driven by the significance of motivational factors (i.e., why do I do it?) compared to expectancy factors (related to "can I do it?") in proactive behaviors (Griffin et al. 2007; Liberman and Trope 1998). The model emphasizes the significance of the types of motivation (the main effect) and the availability of resources that can reduce proactivity risk (the moderating effect). Drawing on Parker's model and others (Amabile 1993; Grant 2007), we examine the effects of three main types of motivation on IwIT and IU: intrinsic (based on egoistic internal sources), social (based on the internal value of altruism and a desire to help), and internalized extrinsic (based on external sources that are internalized by individuals as important values to work in a given context). We also explore the moderating effect of slack resources on the motivation-IU and motivation-IwIT, expecting that they will affect them differently because IU is less risky than IwIT.

Our paper contributes to the literature by first offering a rich conceptualization of IwIT (in an individual's work deliverables or delivery method). We differentiate IwIT from IU, as a different type of innovative behavior with IT and clarify its underlying assumptions, antecedents, and impacts—on mindfulness at work as a criterion variable[1]. Our paper opens up a new avenue for research in which the distinction between IU and IwIT and its implications can be further examined. Second, we explore the effect of various motivations on IwIT and IU. Third, we show that the moderating role of slack resources on different motivational paths to innovation is not a one-size-fits-all effect and offer a more nuanced view of slack resources. The paper contributes to practice by providing insights to managers on what motivates users to innovate within or outside of the

[1] We followed Windeler et al. (2017) in using a dependent variable as a criterion variable.

existing work structure and how to judiciously allocate slack resources to employees with different types of motivation to favor distinct types of innovation.

In the remainder of the paper, we, first, discuss the theoretical boundaries of our study and review the literature. Then, we draw on Parker's model to propose a research model and the hypotheses. Next, we describe the study method followed by the presentation of the results. We conclude by discussing the results, assessing the implications of our research, and suggesting potential avenues for future research.

Theoretical Boundaries

Proactive behaviors are self-initiated and agentic, that is, they are voluntarily done without a request or mandate to do them (Fritz and Sonnentag 2009). They are also change-oriented, that is, they challenge the status quo and create or control a situation (Parker et al. 2006). However, not all proactive behaviors are similar, for example, they may vary in their loci of change (e.g., technology or the work) (Bindl and Parker 2010). While IwIT and IU are both proactive behaviors[2] with technology, we differentiate them based on the focal point of novelty by which they are defined, the goals that drive the behaviors, the primary outcomes, and their scope of impact (Table 1). In the following, we theorize IwIT and differentiate it from IU by specifying what IwIT is (i.e., its content) and what it is for (i.e., its outcomes) (Burton-Jones and Volkoff 2017).

Table 1: Innovating IS use (IU) vs. Innovative with IT (IwIT)

	Innovative IS use (IU)	Innovating with IT (IwIT)
Focal point in defining behavior	Novelty in IT use	Novelty in the work
Goal of behavior	-To support existing work goals -To do the thing right (efficiency)	-To change work goals -To do the right thing (effectiveness)
Primary outcome	Change in work process	Change in work outcomes
Proactive in	Work process	Work outcome
Scope of impact	Mainly self	Self and others

[2] An example of *reactive* innovative behavior is when individuals are "required" to develop a solution with IT for a specified problem (e.g., a think tank brainstorming, mandated by a manager to solve a problem).

Conceptualizations and Assumptions

We conceptualize IwIT as *individuals' use of IT to creatively change their work goals and outcomes.* First, in our definition, the focal point for novelty is the work, rather than IT use. Innovative behaviors in which the focal point of novelty is the IT itself (a new way of using IT, such as extending features in use) are therefore considered IU, not IwIT. In fact, IwIT brings something new to the work, regardless of novelty in using IT. Second, IwIT's primary goal is to change the work goals and structure; and therefore, it brings novel changes to the dimensions of one's work outcomes (i.e., work deliverables and delivery methods). IwIT alters work outcomes with the goal of becoming more effective, instead of adapting the work process to better support existing work goals and structures. Therefore, in contrast to IU that is proactive in changing the existing work process, IwIT is proactive in the work and its outcomes. IwIT is not expected as a job requirement because work outcomes are generally considered as givens. Thus, IwIT is an outcome-oriented behavior directed toward making a change in one's work outcomes.[3] Finally, as an individual's work is integrated into the broader work context (including other colleagues, managers, or clients), when individuals engage in IwIT, they usually affect themselves as well as other people who work closely with them; this is the scope of impact. This is in contrast to IU in which actions are geared to support one's own tasks within the bounds of one's existing work goals with minimal or no ripple effect on others (e.g., finetuning procedures with new features to improve productivity) (e.g., Hsieh and Wang 2007; Li et al. 2013; Liang et al. 2015). When innovating with IT, users

[3] IwIT can be associated with IU despite their distinct nature. When innovating with IT, users aim to change the work outcome, which is likely to require adaptations in the work process. However, those changes in the work process are secondary, consequential adaptations necessary to implement an intended improvement in one's work outcome. Thus, while IwIT can be associated with IU, the nature of these two behaviors, including the focal point of novelty, the goal, primary outcomes, and motivating factors, is different.

discover opportunities in their work outcomes, including linking to others, making plans to pursue these opportunities, and taking action with IT to achieve them.

IwIT is a type of effective direct use behavior (as opposed to indirect or chauffeured use) because it captures how individuals employ a given IT in a way that helps them to attain a goal of innovating in their work outcomes (Burton-Jones and Grange 2013). It is a post-implementation behavior that is becoming prevalent among knowledge workers in contemporary organizations, which increasingly empower individuals to take control and extend the use of IT beyond common use (Nevo et al. 2016). Innovation is increasingly found throughout technology users rather than being centralized in R&D centers (Bogers 2010; von Hippel 2005). IwIT thus assumes that an IT offers options to individual users about ways to think about their work outcomes in relation with others, which facilitates the emergence of several distributed (e.g., Boland et al. 2007; Dougherty and Dunne 2012) and combinatorial innovations (Yoo et al. 2012). Employees possess the "sticky" knowledge of their own work (Morrison et al. 2000) and its integration to other work beneficiaries. They are often in the best position to come up with significantly useful and valuable IT-based work innovations (Lilien et al. 2002).

Outcomes of IwIT

The focal point of IwIT is, therefore, innovation in the work itself (or tasks). Drawing on the literature of innovation in work (e.g., Aaen 2008), we conceptualize the outcomes of IwIT along two dimensions: individual work deliverables, and individual work delivery methods.[4] First, individuals can use IT to develop new *deliverables* or improvements in

[4] Aaen (2008) proposed a third (process innovation in the work processes) and a fourth dimension (people innovation: changing users' mental models). We do not include these dimensions in our conceptualization of IwIT because they consist internal changes to work process or individuals rather than work outcome. The process innovation dimension is already captured in our conceptualization of IU. Adopting this classification also excludes innovation at other levels (organizational innovation) and for purposes other than individual's immediate work in the organization (e.g., contributions to open source development out of work context).

their current deliverables, including modifying an existing company product or service, improving the quality of one's deliverables, or creating new deliverables altogether. This would directly affect the beneficiaries of one's work deliverables (e.g., colleagues, managers, or external customers). Second, users may also develop new or improved ways in which their work deliverable is provided to their work beneficiaries, that is, the work *delivery method*. Delivering one's products and services to clients in an entirely new way, making it easier and simpler for clients to access the products and services, and making service delivery more interactive, are some examples of IwIT in one's work delivery methods. These two dimensions are in association because when employees change their work deliverables, for example, they are likely to change the way they coordinate the work delivery. Therefore, change in one can be correlated with change in the other. For example, when employees adopt Facebook as the main venue for client interaction (delivery method), the items of the report they deliver to their managers are subject to change upon innovating with Facebook as a new delivery method.

IwIT is likely to be riskier than IU because users change their work outcomes, which are often interconnected and intertwined with the work of others. IwIT, therefore, goes beyond an individual's isolated work. It spans to affect the work of other individuals. This increases the risk of exploring new ideas as the scope of consequences is broader and can affect an additional number of beneficiaries. Therefore, innovating with IT is likely to make users more mindful about their work, as they become aware of nuances and further complexities of their work in the broader work context when they see how their IwIT affects others. In addition, IwIT is an unsolicited, proactive behavior in the work, one not expected by managers. Managers do not always appreciate changing work goals and their structure and may even see the change as a threat, distraction, or mode of

ingratiation (Frese and Fay 2001; Grant et al. 2009). Therefore, upon failure, IwIT may be seen as a deviating behavior that just creates problems for oneself and others.

In the next section, we review the literature on innovative behaviors with IT.

Literature Review

IU and IwIT differ along with two key elements of innovation. First, what is new? What is the focal point or object in defining innovative behavior, and second, what does the new idea change (i.e., in what way is it useful)? The first question involves the main focal point of novelty in conceptualizing innovative behaviors, which can be defined based on *the novelty in IT use* vs*. novelty in the work*. The second question involves the nature and aim of the innovative behavior—that is, is it useful in improving *the existing work practices* or in *creating new work outcomes and goals* (Nevo et al., 2016)? Innovative behaviors with IT can vary based on these two questions. These conceptualizations are summarized and illustrated in Table 2.[5]

Table 2 includes five columns starting with the concept, as a type of innovative behavior with IT. The second column is the defining source of the action's novelty (question 1). It asks "where is the novelty in the action? Is 'the use of IT' new or does the action's novelty reside 'in the work'?" The third column focuses on the context of action and asks whether the action is useful in better supporting existing work goals or does it create new work outcomes and goals that are not among existing job requirements (question 2). This is an important distinction because it helps to differentiate the source of change by

[5] We systematically reviewed the basket of eight IS journals (except JSIS, which is at organizational level) and sought papers that included the terms "innovative" and "behavior" or their derivatives as well as synonyms (e.g., "innovating," "creat*", "reinvent*", "improvise," and "behavior" or "behave"). After reading the abstracts, we excluded the papers that did not discuss innovative use (e.g., method papers, abusive, non-individual, adoptive, or adaptive behaviors). We also went backward through the reference list of the chosen papers to find new relevant articles (e.g., Kim and Gupta 2014; Magni et al. 2010; Saga and Zmud 1994).

zeroing in on the components that form the innovative behaviors; that is, when innovating, does the behavior interact with the work process that a user follows to accomplish his or her task, or does the innovative action interact with other aspects of the work (the work deliverables, and delivery methods). The fourth and fifth columns include antecedents of innovative behaviors and their representations (e.g., measures).

Table 2—Innovative behaviors with technology

Concept	Focal point of action novelty (novelty in ...)		Action goal (useful in…)		Antecedents		Representative quotes, measures, or explanations
	In IT use	**In the work**	**Realizing existing work goals**	**Developing new work goals**	**Expectancy factors** (Can I do it?)	**Motivational factors** (Why should I do it?)	
Extended use: Using more functions of an IT to accomplish the job (Liang et al. 2015; Hsieh & Wang 2007)	√		√		• Autonomy (Liang et al. 2015)	• Perceived usefulness (Hsieh & Wang 2007)	• "I often use more features than the average user of the ERP system installed in my organization to support my work (Liang et al. 2015, p. 353)"
Extended use: Using more of the system's available features to complete tasks (Kim & Gupta 2014; Saga & Zmud 1994)	√		√		• User empowerment		• "the use of more of a system's features to perform tasks without consideration of the interconnectedness of these tasks with others (p. 657)"
Emergent use: Using an IT in a new manner to support tasks (Kim & Gupta 2014; Saga &Zmud 1994)	√		√		• User empowerment		• "The uniqueness of emergent use … lies in finding new ways to apply the system even with those frequently used system features to the performance of tasks (p. 657)".
Exploration-to-innovate: The degree to which a user tries to find, extend, and/or change features of an IT to accomplish his or her tasks in novel ways (Bala and Venkatesh 2016)	√		√		• Perceived opportunity • Perceived controllability		• To "[d]iscover new ways of using the system to accomplish my tasks" or "[e]xperiment with the system to find features to accomplish tasks in novel ways. (p. 170)"
Innovative use: Employees' discovery of new ways to use IS to support their work (Li et al. 2013)	√		√			• Perceived usefulness • Intrinsic motivation	• "Routine use (RTN) refers to employees' using IS in a routine and standardized manner to support their work, and innovative use (INV) describes employees' discovering new ways to use IS to support their work (p.659)". • Extended, emergent use, intention to explore, and trying to innovate with IT are classified under innovative use
Task Innovation: The extent to which an IT helps the user create and try out new ideas in their work (Deng et al. 2008)		√	√		• Absorptive capacity		• When an application helps a user to "come up with new ideas", "create new ideas", "try out innovative ideas" (p. 81)"
Propensity to innovate in IT: A user's learned predisposition to create new applications of IT in their work context (Nambisan et al, 1999)		√	√				• "it is viewed as a learned disposition that evolves interactively over time during the organizational tenure of an individual (p.372)"

Collaboration technology exploration: The extent to which users explore IT for application in their work. (Maruping and Magni 2015)		√	√		• Intention to continue exploring • Expectation to continue exploring		• "I explore [system name] to enhance my work effectiveness" • "I explore [system name] for potential application in my work."
IT reinvention: Change in an implemented IT and/or its use to pursue new goals (Nevo et al, 2016)	√			√			• IT reinvention is "a process of projective agency in which users act as purposeful and future-oriented actors who form and pursue goals by creating new technological capabilities."
Intention to innovate: A developer's belief about future involvement with creating new mobile data service application (Kankanhalli et al. 2015)		√		√		• Extrinsic reward • Enjoyment • Recognition	• User intention to create or develop service applications by iOS or Android developers
Technology-enabled innovation: The development and implementation of creative ideas and solutions for the customer through application of salesforce IS. (Tarafdar et al. 2015)		√	Not clear		• Technology competence		• When an IT helps users "to identify innovative ways of doing my job," "to come up with new ideas relating to my job," "to try out innovative ideas" (p. 119)
Intention to explore: A user's willingness and purpose to explore a new technology and find potential uses (Magni et al, 2010).	√		Not clear		• Cognitive absorption • Personal innovativeness	• Performance expectancy • Extrinsic motivation (better image)	• I intend to explore new IT for potential application in my work context • I intend to explore new IT for enhancing the effectiveness of my work
Trying to innovate with IT: An individual's attempt to develop applications of IT that may optimize their task performance (Ahuja and Thatcher 2005)	Not clear		Not clear		• Autonomy • Overload		• I try to find new uses of IT. • I try to use IT in novel ways.
Enhanced use: Novel ways of employing IT features (Farima Bagayogo et al, (2014)	Not clear		Not clear				• Using a formerly unused set of available features • Using an IT for additional tasks

Our review of the literature leads to three key observations. First, IS research has predominantly conceptualized innovative behaviors based on the novel changes *in IT use*. Accordingly, the source of novelty is specified as either the use of more new features (Bala and Venkatesh 2016; Hsieh and Wang 2007; Jasperson et al. 2005; Kim and Gupta 2014; Liang et al. 2015; Saga and Zmud 1994) or more generally, a new use of the IT as a whole (Ahuja and Thatcher 2005; Boudreau and Robey 2005; Li et al. 2013; Nevo et al. 2016). In contrast, there are also some innovative behaviors that are conceptualized based on the novelty they bring to *the work*, specifically the extent to which a user creates and tries out new ideas in his or her work (Deng et al. 2008; Nambisan et al. 1999). However, these behaviors remain at a high level and do not delineate the work aspect that is changed by the innovative behavior, specifically, to a user's work such as work deliverables to others (e.g., customizing work deliverables to the needs of clients, or adding new functionalities to one's deliverable report to a manager) or work delivery methods (e.g., easing clients' access to one's product or service, or becoming more responsive to them). As an exception, while Kankanhalli et al. (2015) conceptualized intentions to innovate in the work deliverable, they study IT developers (such as developers' creating a new service application for clients), rather than IT users. Also, some conceptualizations remain unclear regarding the source of novelty (Ahuja and Thatcher 2005; Farima Bagayogo et al. 2014). For example, while an item, in measuring enhanced use (Farima Bagayogo et al. 2014), resembles novelty in IT use ("using a formerly unused set of available features"), another item can be interpreted as novelty in the work ("using an IT for additional tasks").

Second, past conceptualizations are defined based on the behavior's contribution to improving one's existing work process toward the attainment of *existing goals*. These studies explore how the innovative behavior with technology in the work process has led

to better support for existing work goals (e.g., performance optimization in Ahuja and Thatcher 2005) in an inward interaction of users with IT to "supports tasks" (Kim and Gupta 2014; Li et al. 2013). Therefore, changes to work goals and outcomes are not a focus in defining the goal of the behavior (i.e., the work goals and outcomes are taken for granted). Despite its dominance, not all innovative behaviors with IT aim at making improvements and being useful within existing work goals. Some conceptualizations remain unclear. For example, technology-enabled innovation (Tarafdar et al. 2015) explores when IT leads to "innovative ways of doing my job" (p. 119), which can include changes to work processes to attain existing work goals or development of new work goals (e.g., by creating new work deliverables or delivery methods). Therefore, existing research has rarely explored innovative behaviors that change existing work goals and outcomes. As exceptions, IT reinvention is defined based on the contribution to *creating new work goals*, that is, novel uses of IT to pursue new goals (Nevo et al, 2016).

Third, the majority of the studies have examined the expectancy antecedents of innovative behaviors (i.e., can I be innovative with IT?) such as autonomy, user empowerment, perceived opportunity, perceived controllability, knowledge deficiency, absorptive capacity, personal innovativeness, or overload. However, despite the importance of motivational factors in predicting proactive behaviors (Parker et al, 2010), few papers explored motivational antecedents (i.e., why should I innovate with IT?).

In summary, IS research has not differentiated between IU and IwIT and, according to our conceptualization, it has mainly studied IU, that is, behaviors that creatively use IT to better support and improve existing work practices and goals. Our knowledge of how individuals use IT to proactively make novel changes in their work deliverable, or delivery method (i.e., IwIT) is limited.

Theory and Hypotheses

In this section, we present Parker's model and draw on it to develop our model.

An Overarching Model of Proactivity

Parker's theory of proactive behavior (Parker et al. 2006, 2010) serves as the theoretical foundation for our work. According to Parker, behaviors to proactively change a situation are driven by the interaction of internal factors (individual's expectancy and motivational) and external resources in an organizational environment that reduce the risk associated with proactivity for users (e.g., availability of slack resources) (Figure 1). Internal factors include two general categories: motivation (Do I need to do it?) and expectancy (Can I do it?) (Bindl and Parker 2010; Parker et al. 2006, 2010; Peng et al. 2014).

Motivational factors are related to the reason behind individuals' proactivity and originate from egoistic internal sources (intrinsic motivation), social and other-focused sources (such as social motivation, based on the desire to help others) or internalized external sources (internalized extrinsic motivation) (Amabile 1993; Gagné and Deci 2005; Grant 2007). Individuals' volitional motivation is critical for taking risks and engaging in changing a situation (Bindl and Parker 2010). *Expectancy factors* arise from an individual's perceived control; and are rooted in self-efficacy perception and control appraisal, which is mainly individuals' concern about their ability to undertake a given task successfully. Individuals need to feel autonomous and self-efficacious in order to engage with proactive behaviors that challenge the status quo (Gagné and Deci 2005). To change the situation, individuals need to realize that they have control over their work and be confident about their disposition to follow an alternative path[6].

[6] Given the inclusion of 'can do' and 'reason to' factors, for two reasons, we have excluded the third category of internal factors "energized to" which refers to activated positive affective states. First, our model

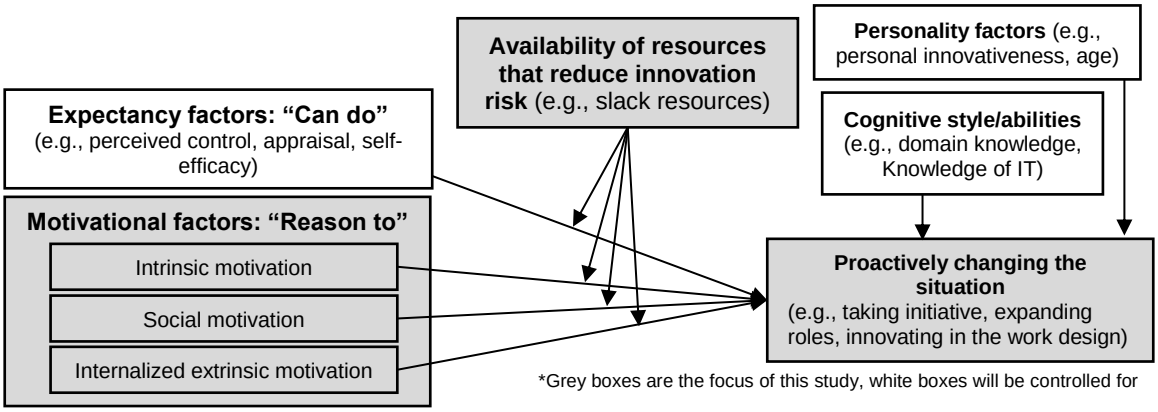


Fig 1. A motivational model of proactive behaviors, adapted from Parker et al. (2010)

In addition, the effect of internal factors (expectancy and motivational) on proactive behaviors depends on the availability of resources in the work environment that reduce the risk of innovative behaviors, such as slack resources (Parker 2014; Parker et al. 2010, 2013). Given management hesitation about individual proactivity (Parker et al., 2006, Grant et al, 2009), individuals would not risk being proactive if there are few slack resources, despite being motivated and capable. That is because proactivity consumes time and mental energy, which increases the risk and responsibility associated with unsolicited behaviors (Bolino et al, 2010). In this paper, we focus on the grey areas in Figure 1. We adopted a motivational lens, as psychology research shows that motivational antecedents are stronger predictors of proactive behaviors with long-term or wider impact (Parker et al, 2010; Liberman and Trope 1998; Griffin et al, 2007). As indicated in the literature review, IS studies have examined expectancy factors to a great extent. Since we want to complement extant research, expectancy factors are not the focus of our paper and therefore will be treated as a control in our study.

takes a cognitive-motivational approach, rather than emotional. Including emotional factors would require treating these factors independently (e.g., in measurement and duration of impact), given their essential differences with cognitive motivational factors (Beaudry and Pinsonneault, 2010). Otherwise, their inclusion can lead to a more complex model. Second, their exclusion is justified as Parker et al. (2010, p.839) argue that "energized to" factors can "influence proactivity indirectly, via "can do" and "reason to" states." Therefore, the effect of "energized to" factors have already been captured by the existing factors.

Research Model and Hypotheses

In this section, we develop a model that examines the relationships between different types of motivation and IwIT vs. IU, and the moderating role of slack in IS resources.

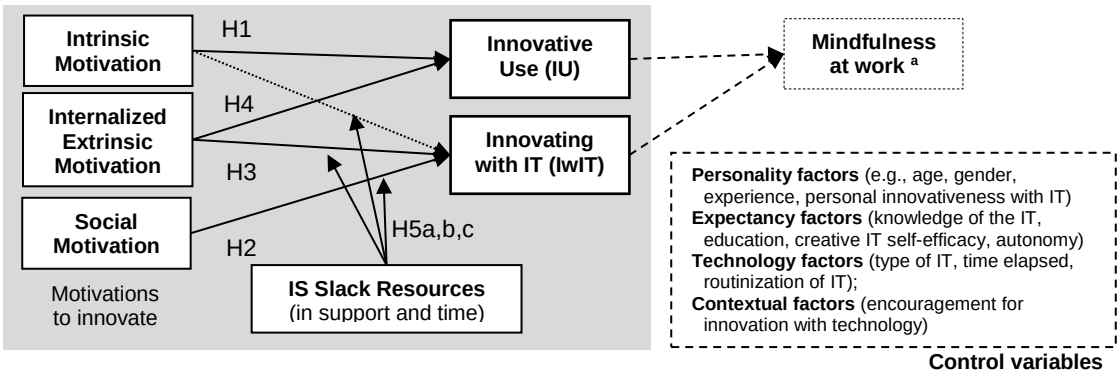
As shown in Table 3, drawing on Parker's theory, we examine three different types of motivation to innovate with technology. Motivation shapes cognitive processing (Lang 2000) and its type influences the way users select, encode, and retain information (Grant and Berry 2011). *Intrinsic motivation to innovate* is fundamentally driven by an inherent interest and a desire to explore and exploit. *Social motivation to innovate* is based on a desire to change the way one works, hoping that it might also lead to an improvement in other people's work and performance. It is mainly altruistically driven. Finally, *internalized extrinsic motivation* to innovate is mainly driven by the fact that the external benefits to innovate have been internalized by individuals. Here, the focus is on exploiting technology with the hope that it will increase one's own performance.

Table 3: Intrinsic, social, and internalized extrinsic motivation to innovate with technology

	Intrinsic Motivation to Innovate	Social Motivation to Innovate	Internalized Extrinsic Motivation to Innovate
Source	Inherent interest in and enjoyment of using IT in a novel way; derived from direct experience with IT	Altruistic inclination to use IT in a novel way to improve one's work with the hope that it will also help others and contribute to a mission beyond self	Intention to use IT in a novel way so that it helps accomplish one's job as expected by the work environment
Focus	Internal and, sometimes, isolationist	External and collaborative	External, but internalized
Goal	Self-satisfaction	Making a positive difference in the workplace	Getting the job done
Orientation	Internally oriented: engaging with IT for personal enjoyment	Outcome-driven: engaging with IT as an instrumental way to attain an outcome, such as helping others improve their work practice	Both outcome-driven (need to deliver outcomes and meet external expectations) and internally oriented (with persistence and interest)
Span of attention	Deep attention to a specific area of personal interest	Wide focus of attention, on others, the work context, and relationships	Deeper attention to the areas of interest and wider focus in the areas of work expectation
Advantages as a source of innovation with technology	• Promotes cognitive flexibility & risk propensity • Leads to positive emotions (e.g., confidence, self-esteem) • Encourages persistence	• Takes others' perspectives into account • Encourages collaborative problem-solving • Leads to realization of integrative opportunities	• Goal-oriented searches • Motivated, selected information processing

We suggest differential effects of the types of motivation on IwIT vs. IU (see Figure 2). Intrinsic motivation to innovate is hypothesized to influence IU (but not IwIT) through self-interest and enjoyment within the bounds of the existing work. Social motivation to innovate is postulated to foster IwIT (but not IU) due to users' cognizance of a broader view of how their innovations in the work outcome can benefit others, whose work is integrated into that of the user. Finally, we hypothesize that internalized extrinsic motivation to innovate leads to both IwIT and IU. Finally, we theorize that IS slack resources (in support personnel and time[7]) will moderate the relationship between motivations and IwIT (but not IU), as IwIT is inherently riskier compared to IU. Although not hypothesized, we believe that the inclusion of mindfulness at work as a criterion variable will provide nomological validity and greater credibility to our theorizing in differentiating IwIT and IU.

For the sake of completeness and to integrate past findings, we also control for the effect of key factors related to personality, expectancy, technology, and context.



* The dotted line represent a not-hypothesized path.
[a] The dashed lines between the innovative behaviors and mindfulness at work represent a relationship that is not hypothesized but used as a criterion variable.

Fig. 2. Research Model

[7] extra number of IS support personnel and extra time for exploration with IT beyond what is required by users for routine job accomplishment

Intrinsic motivation and IwIT vs. IU

Intrinsic motivation (IM: the desire to be involved in an activity based on self-interest and spontaneous satisfaction in the activity) triggers an *internally oriented* path in which individuals are driven by an inherent interest and enjoyment in the innovation process itself (Amabile 1993; Grant 2008). When intrinsically motivated, incentive cannot be separated from action (Schroeder and Fishbach 2015); involvement in the process becomes an end in and of itself. First in this process, intrinsically motivated individuals expend efforts to satisfy their interests and curiosity (Deci and Ryan 1985). Next, they selectively notice, encode, and retain information that is consistent with their desires and goals (Grant and Berry 2011). They narrow their attention to an activity of interest and become increasingly exploratory, playful, and immersed in it; for intrinsically motivated individuals, an experience may range from playfulness to flow (Parker et al. 2010). Intrinsic motivation is associated with individual innovation (Amabile 1996; Eisenberger and Aselage 2009; Gagné and Deci 2005; de Jesus et al. 2013) by promoting playfulness (Bindl and Parker 2010; Mainemelis and Ronson 2006; Shalley et al. 2004).

We argue that, following an IT implementation, intrinsic motivation is positively associated with IU. That is because intrinsic motivation is associated with several antecedents of individual innovation (e.g., positive affect, desire for learning, persistence, pursuit of interests, and curiosity—Amabile et al. 2005; Deci and Ryan 1985) that are specifically relevant to IU. In particular, intrinsically motivated users emphasize means (or process) more than ends (or outcomes) (Grant and Berry 2011, Starbuck and Webster 1991), have a better quality of user-IT interaction, and typically engage more with technological exploration and play (Webster et al. 1993). They explore their novel ideas (Leonard-Barton 1988; Sun 2012) to increase both pleasure from an activity and involvement in ways such as asking what-if questions, massaging data,

investigating possibilities, seeing results, or discovering more efficient ways of working (Lieberman 1977, Starbuck and Webster 1991). At the same time, with its internal orientation, intrinsic motivation leads to exploration, typically, in the work process and within the bounds of existing expectations (Parker et al, 2010). Thus, following a recent IT implementation and potential disruption of work processes (Tyre and Orlikowski, 1994), intrinsic motivation to innovate is likely to be associated with individuals trying to creatively use IT to improve their existing work process. Our first hypothesis, then, is:

H1. Following a recent IT implementation, intrinsic motivation is positively associated with IU.

In contrast, however, we do not hypothesize a similar relationship between intrinsic motivation and IwIT. Since IwIT is relatively risky, we expect that intrinsic motivation will not be sufficient by itself to stimulate this innovative behavior. Intrinsic motivation is expected to be associated with IwIT when combined with IS slack resources. This is discussed in detail in the moderation section.

Social motivation and IwIT vs. IU

Social motivation (SM: the desire to be involved in an activity to help others; also known as prosocial motivation), originates from an internal sense of integrity and the drive to fulfill core values to the self, including altruistic values (Grant and Mayer 2009; McNeely and Meglino 1994). Human beings are naturally inclined to be prosocial and need to be related to others (Gagné 2003; Ryan and Deci 2000a). When socially motivated, individuals engage in discretionary behaviors beyond their job requirements (Bateman and Organ 1983), invest significant effort toward considering others in their actions and decisions, despite any difficulty in means (De Dreu and Nauta 2009; Grant 2012). Thus, social motivation engages individuals in momentary, instrumental behaviors that are

altruistically directed at helping others (Grant 2008; Weinstein and Ryan 2010) and making a positive difference in other's lives, work, or well-being (Grant 2007).

Social motivation is independent of intrinsic motivation (De Dreu and Nauta 2009), a temporary psychological state that is *outcome driven.* Socially motivated individuals see work outcomes as a means to the end goal of helping others (in contrast to intrinsic motivation, which is internally focused on the process of delivering existing work as an end per se) (Grant 2007, 2008). Thus, social motivation is other-oriented rather than self-oriented as in intrinsic motivation (De Dreu and Nauta 2009). This leads socially motivated individuals to expand their span of attention to include others (Grant and Berry 2011), and to increase the extent of interaction with beneficiaries of their work outcomes—e.g., managers, colleagues, or clients (Grant 2012; Grant and Parker 2009).

Social motivation has been positively associated with individual innovation (De Dreu et al. 1998, 2000; Polman and Emich 2011). According to the principles of heuristics, individuals use vividness and ease of recall as cues for value (Kahneman and Tversky 1979). In the context of social motivation, daily contact with beneficiaries makes colleagues or clients who are affected by one's work outcomes "more cognitively accessible and emotionally vivid (Grant 2012, p. 461)". The socially motivated tend to have positive attitudes, engage in constructive exchanges of information with others, and consider others when innovating. Therefore, they are more engaged with problem-solving behaviors, less involved with contentious behavior, and thus, realize integrative opportunities to a greater extent compared to egoistic individuals (De Dreu et al. 2000, 1998). Attending others and realizing integrative opportunities enhances an individual's ability to be more relevant and useful and, subsequently, innovative (Grant and Berry 2011; Polman and Emich 2011).

Given the outcome orientation and other focused nature of social motivation outcome, we suggest that, following an IT implementation, social motivation is directly associated with IwIT, but not IU. IT, especially if recently implemented, provides a fertile context for socially motivated individuals to go beyond their existing work practices and goals and help others while reinventing their own work outcomes (see von Krogh and Spaeth 2007; Wasko and Faraj 2005). In general, IS research shows that IT users' moral duty and social motivation lead individuals to use IT, leverage its malleability, and proactively help others (Wasko and Faraj 2000). More particularly, with a broader focus of attention, socially motivated users are in a better position to innovate with IT after an IT implementation has disrupted many users' work processes and procedures (Tyre and Orlikowski 1994). Therefore, when socially motivated, IT users consider a broader and extended view of their work outcomes, better realize integrative opportunities between their work outcomes and others (Yen et al. 2015), and engage in *instrumental,* extra-role behaviors (by including or anticipating others' needs and personalizing their technology or work) in a way that clearly benefits self and others (Deng et al. 2015). For example, individuals with greater social motivation tend to help others in online communities and are more innovative with open source software (Von Krogh et al. 2012; Wu et al. 2007).

Thus, in contrast to intrinsic motivation (i.e., internally focused on the existing work process and leads to IU), socially motivated users are able to maintain multiple as well as broader perspectives, which facilitates divergent thinking and idea generation (Vincent et al. 2002) in the work outcomes; and subsequently innovation with IT (Faniel and Majchrzak 2007). In our second hypothesis, we propose a positive association between social motivation and IwIT:

H2. Following a recent IT implementation, social motivation is positively associated with IwIT.

At the same time, given the outcome orientation of social motivation, we do not expect it to be associated with IU, which is the result of an individual's isolated explorations in the work process driven by personal interest.

Internalized extrinsic motivation and IwIT vs. IU

Extrinsic motivation (EM: the desire to be involved in an activity to gain external benefits apart from the activity itself) originates from the instrumentality between an activity and its results (i.e., it is outcome-oriented). Early research in management and psychology showed extrinsic motivation to be amotivational and therefore, detrimental to innovation (Amabile 1993; Deci et al. 1999; Vallerand 1997). In particular, extrinsic constraints (e.g., financial rewards for certain actions) are detrimental to innovation (Hennessey and Amabile 2010) because they create a sense of external pressure and consequently limit individuals' autonomous action, motivation, and drive toward self-determination (Gagné and Deci 2005). An example would be a student who does his homework to adhere to a parent's control and a fear of penalty. Later studies show that extrinsic motivation varies in the extent to which it is autonomous versus controlled (Ryan and Deci 2000b). This body of research found that "internalized" extrinsic motivation can foster creativity and innovation (Gagné and Deci 2005). Internalization and integration occur when individuals understand values of external regulation, realize the importance of those values, and adopt them into their own values as self-regulation, eliminating the need for external forces to continue a behavior (Ryan and Deci 2000b). Imagine a student who does her homework because she has realized the usefulness and the value of homework for her future career success. While this example is similar to the previous one (homework done due to parents' control) because it involves instrumentality rather than pressure, the latter involves a feeling of choice and personal endorsement (Ryan and Deci 2000a).

Internalized extrinsic motivation is *both outcome oriented and internally oriented*. Thus, while instrumentality and *outcome orientation* remain bold in extrinsically motivated individuals, internalization promotes *internal orientation* and further engagement with intrinsic aspects such as exploration, persistence, and behavioral quality (Ryan and Deci 2000a). Therefore, we suggest that internalized extrinsic motivation is positively associated with both IwIT and IU.

First, drawing on the outcome orientation and instrumental nature of internalized intrinsic motivation (Parker et al. 2010), we argue for a positive association between internalized extrinsic motivation and IwIT. Implementation of a new IT and the firsthand experience of users (Bhattacherjee 2001) can lead to a reassessment of one's work goals beyond initial expectations. When users recognize the benefits and opportunities of a newly implemented IT (i.e., internalization), the utilitarian nature of the benefits (Magni et al. 2010) leads them to rethink their existing work goals and implement changes in their work outcomes. Internalized extrinsic motivation yields important work outcomes ranging from greater innovation, conceptual development, and cognitive flexibility (Gagné and Deci 2005). In parallel, IS research shows that when users see opportunities in using a new IT and its features, they employ a benefit maximization strategy (Beaudry and Pinsonneault 2010) by proactively exploring alternative use of the IT in their work and becoming more willing to risk by innovating with IT (Wang et al. 2008), to benefit self and others. Thus our third hypothesis:

H3. Following a recent IT implementation, internalized extrinsic motivation is positively associated with IwIT.

Drawing on the internally oriented aspect of internalized extrinsic motivation (Parker et al. 2010), we also argue for a positive association between internalized extrinsic motivation and IU. In general, the internalization of extrinsic values promotes

involvement with intrinsic aspects, such as exploration, persistence, and behavioral quality (Parker et al. 2010). This is associated with explorations within the bound of existing work practices, which is significantly different from the goal-driven behavior using IT to change work goals and outcomes. When internalizing and adopting job goals and values, users are further motivated to explore with IT (Karahanna and Agarwal 2006; Liang et al. 2015) and seek new ways of using it to support their tasks, especially if they find it useful to attain their goals (Starbuck and Webster 1991). Users with high levels of internalized extrinsic motivation are committed to using a newly implemented IT, considering a direct use-performance relationship, and subsequently finding new uses for IT in improving their existing work practices (Agarwal 2000; Karahanna and Agarwal 2006). Internalized extrinsic motivation leads individuals to find further opportunities in using the technology, which is shown to be positively associated with their extension of efforts to extend and change features of an IT to accomplish existing tasks in novel ways (i.e., IU) (Bala and Venkatesh 2016; Hsieh and Wang 2007).

IS research has considered performance expectancy as a proxy for internalized extrinsic motivation (Li et al. 2013). Performance expectancy refers to users' perception of whether using an IS will be associated with some benefits in achieving work goals. Performance expectancy is an internalized extrinsic motivation because it captures a user's perception of the value of using an IT for his or her career or organizational success (Davis et al. 1989). This is in contrast to purely extrinsic motivation such as acting based on organizational pressure or for cash rewards. Empirical IS research supports the link between internalized extrinsic motivation and its behavioral antecedents of IU, including play, exploration, or intention to explore in existing work practices (Hackbarth et al. 2003; Liang et al. 2015; Thatcher et al. 2011). For instance, in a survey of 268 users of a collaboration technology in two large European firms,

Maruping and Magni (2012) found a positive and significant relationship between performance expectancy and the intention to explore a new technology, which is under the umbrella of IU. In the context of a website, attributes of performance expectancy (e.g., speed, and compatibility) were found to enhance playfulness in the existing work (Chung and Tan 2004; Tan and Chou 2008), which is a behavioral antecedent of IU. Thus, we propose our fourth hypothesis:

H4. Following a recent IT implementation, internalized extrinsic motivation is positively associated with IU.

However, according to Parker's model, the significance of the relationship between motivation and innovation depends on the availability of resources in the work context that reduces significant risks associated with proactivity.

Moderation of Risk-Reducing Resources

The availability of risk-reducing resources in the work environment is key for strengthening the relationship between motivation and proactivity (Aspinwall 2005; Parker 2014; Parker et al. 2010, 2013).

Proactive behaviors are associated with a significantly higher degree of performative and psychological risk (Parker et al. 2010; Parker and Collins 2010). First, proactive behaviors increase users' performative risk as they are resource intensive, requiring extra resources beyond those necessary for core job performance (Parker et al. 2013). Behaving proactively depletes time and mental energy as it requires users to allocate resources to unsolicited behaviors with uncertain future consequences (Bolino et al. 2010). Second, proactive behaviors enhance users' psychological risk as they position users to be more subject to negative evaluation (Frese and Fay 2001). Proactive behaviors are most important in "weak situations" in which goals are less clear, when

there is uncertainty regarding the means for achieving them, and attainment of goals is not clearly linked to rewards (Griffin et al. 2007). Lack of risk-reducing resources would put stress and pressure on users that leads individuals to focus on the technical details (Staw and Boettger 1990), to become less mindful about broader work (Langer 1989), and to be preoccupied with what is expected rather than trying proactive behaviors (Fritz and Sonnentag 2009). Thus, risk-reducing resources provide individuals with a climate of psychological safety (Edmondson 1999; Elsbach and Hargadon 2006).

By reducing perceived risks, the availability of extra resources in the work environment is a key facilitator of innovation by motivated individuals (Fritz and Sonnentag 2009; Grant and Parker 2009; Ohly et al. 2006; Unsworth and Clegg 2010; Wu et al. 2011). The perception of resource abundance can engage people in creative behaviors (Rasulzada and Dackert 2009). It can fundamentally change an individual's *cognitive schema* from a risk-averse passivity within the bound of the existing work goals to (1) proactivity as a problem-solver, environment changer, and seeker of opportunities and (2) divergent thinking about improving the broader work environment. This active thinking beyond existing work expectations could be especially magnified when associated with a novel situation such as a recent IT implementation (Park et al. 2012; Sun 2012). Thus, we draw on the moderating role of risk-reducing resources in Parker et al.'s (2010) model to argue for the moderating role of perceived slack in IS resources—specifically in time and support—on the link between motivation and IwIT, but not on its link to IU.

Perceived IS slack refers to an individual's *perception* of the availability of a surplus of IS resources: time for innovation and IS support personnel, beyond what is considered necessary to accomplish routine tasks. Perceived IS slack is a higher-order perception which is formed based on the availability of specific extra resources that are required for IwIT (Rahrovani et al. 2018). First, we argue that, for IwIT, employees need extra time

specifically for exploring the consequences of IwIT on themselves and others. An employee can proactively take alternative paths in his or her work when extra *time for exploration* exists, which does not jeopardize the accomplishment of routine jobs (Amabile et al. 2002). Second, for non-IT experts, exploring new avenues with IT could be risky and stressful due to their lack of in-depth knowledge about IT and its impacts on the broader work context (e.g., others). During an IT implementation, the availability of extra IT support personnel who are available provides peace of mind for motivated users (Deng et al, 2015). When bundled together, the availability of extra time for exploration and additional support IT personnel collectively facilitate the perception of a supportive environment that reduces the risks of proactivity in the work. In contrast, the perception of sufficient or limited IS resources discourages motivated users to engage with IwIT and change their work outcomes. That is because individuals have a stronger tendency to avoid losses (e.g., incomplete routine tasks based on existing work structure) rather than acquire gains (e.g., through IwIT) (Kahneman and Tversky 1979).

In the following, we elaborate on the specific mechanisms by which perception of IS slack resources moderates the link between motivation and IwIT. While we do not hypothesize a direct relationship between intrinsic motivation and IwIT, we propose that the availability of IS slack interacts with intrinsic motivation to predict IwIT.

IS slack resources reduce users' perceived risks of following their personal interest to change the broader work proactively. In the previous section, we did not propose a positive relationship between intrinsic motivation and IwIT. That is because, while intrinsic motivation is a factor that might be related to IwIT, it may not be strong enough to have a direct effect on its own, given the high risk associated with IwIT (compared to IU). Intrinsic motivation originates from self-interest in the process of engaging with an act, and not from its outcome (Parker et al, 2010). Thus, while intrinsically motivated

users may have interest in trying out ideas, the driving force for IwIT may not be enough for several reasons: First, IwIT is a risky unsolicited behavior that changes the external environment (Parker and Colin, 2010) and is associated with greater performative and psychological risks (Parker et al, 2010). Second, in comparison to IU, IwIT requires high-quality interpersonal relationships (Grant and Parker, 2009) since its consequences will affect others whose work is integrated with the user's work. However, intrinsic motivation is internal and mostly isolationist. Finally, managers do not always appreciate proactivity in changing work outcomes and may see proactive behaviors (such as IwIT) as a threat (Frese & Fay, 2001), an ingratiation attempt, or an ill-timed distraction (Grant et al, 2009). These, collectively and radically increase the risk for users to engage in IwIT driven by intrinsic motivation (compared to IU). Therefore, we do not hypothesize a direct relationship between intrinsic motivation and IwIT.

We do hypothesize that the availability of IS slack resources interacts with intrinsic motivation to predict IwIT because IS slack reduces users' perceived psychological risk and fear of exploring personal interests out of the scope of one's isolated work processes. Intrinsic motivation is associated with users' openness to other possibilities with IT (Webster et al. 1993) and intentions to deviate from routines to test hypotheses and what-if scenarios (Starbuck and Webster 1991; Woszczynski et al. 2002). However, as discussed, intrinsic motivation is mostly realized in the form of playfulness in isolation (within the bounds of existing work structures) and subsequently IU, without taking the risks of IwIT. For example, Desouza et al. (2007) quoted an engineer who was hesitant to innovate with IT: "During the initial use of IDE [integrated development engine], I did not know what would happen if I changed an option . . . would it be that I would screw things up." (p. 213) The uncertainty about the consequences of exploring self-interest in a broader work context can be reduced by the availability of IS slack resources. An

environment with time slack can enhance psychological safety in exploration (Bowers 1968; Schein 2009). Support personnel are also critical in managing unexpected incidents (Weick and Sutcliffe 2007). Thus, we propose the first part of a fifth hypothesis:

H5a. Following a recent IT implementation, IS slack resources positively moderate the relationship between intrinsic motivation and IwIT.

The availability of IS slack also strengthens the direct links between the other two outcome-oriented motivations (social and internalized extrinsic motivation) and IwIT by mainly reducing perceived performative risks in using a new IT to either helping others or creating new work outcomes beneficial to the organization.

Outcome-oriented innovations in the work require allocation of extra resources (e.g., attention, time, and potentially material resources) other than what a user is in charge of. When resources are optimally allocated for routine tasks, motivated users perceive some risk in engaging in deviating behaviors because there are some uncertainties in the ability to successfully implement routine tasks with fewer resources. This could negatively affect routine task performance (Bergeron 2007) as well as increased role overload (Bolino et al. 2013). As a result, despite being motivated to innovate with IT, under optimal or suboptimal allocation of resources, motivated users might further refrain from innovating because they are afraid that this might negatively affect their job performance and dimensions of their work (Criscuolo et al. 2013). We argue that IS slack provides a cushion that reduces perceived performative risks associated with allocating resources needed for routine job performance to an alternative use.

In particular, slack inhibits motivated users from preoccupation with daily performance (Fritz and Sonnentag 2009) and its technical details (Staw and Boettger 1990). It helps users to maintain broad attention to integrative opportunities across work boundaries

and maintain a mindful cognitive state that holds multiple perspectives, an antecedent of IwIT. Thus, we argue that IS slack resources can strengthen the relationship between social motivation and IwIT. IS slack can also strengthen the relationship between internalized extrinsic motivation and IwIT as users see less risk in trying opportunities with a new IT to maximize organizational benefits (Beaudry and Pinsonneault 2005) and become more willing to innovate with IT (Wang et al. 2008). As a result, we suggest that IS slack resources can be considered as "the resource" to think divergently about novel opportunities (Vincent et al. 2002) with IT, hold multiple perspectives, and employ benefit maximization strategies (Elie-Dit-Cosaque and Straub 2011) without harming routine job performance. This will enhance risk propensity among motivated users and therefore, strengthens the link between motivation and IwIT. Thus, we propose:

H5b,c: Following a recent IT implementation, IS slack resources positively moderate the relationship between social motivation and IwIT (H5b), and internalized extrinsic motivation and IwIT (H5c).

In summary, our model suggests that different types of motivations differentially lead to IwIT vs. IU. We also expect IS slack resources to positively moderate the paths between motivations and IwIT, but not with IU. In the next section, we develop the methodology by which we test the model.

Method

We used the survey method in order to collect data from a diverse range of IT users. Use of a cross-sectional questionnaire has long been a common method for studying individuals' use of technology in top IS journals (Li et al. 2013; Schmitz et al 2016). In the context of this study, we used self-report measures because they are more appropriate for boundary-spanning, proactive individual behaviors (Behrman and Perreault 1984)

such as IwIT and IU and are argued to be adequate for capturing creative (Shalley and Zhou 2008) and innovative acts (e.g., Li et al. 2013).

Development of Measurement Instruments

We measured social, intrinsic, and internalized extrinsic motivation, and IU by using prevalidated scales, and we developed new measures for IS slack and for IwIT. We followed the procedure by MacKenzie et al. (2011) to develop a new instrument for IwIT and IS slack resources. Appendix A provides the details of the instrument development and validation, the conceptualization of the constructs, their operationalization, as well as the items and their sources. We operationalized internalized extrinsic motivation using performance expectancy, which refers to users' perception of whether using an IT will be associated with some benefits, specifically greater work performance. Consistent with IS research (Davis et al. 1989; Li et al. 2013), we use performance expectancy as a surrogate for internalized extrinsic motivation as it captures users' perception of the value of using an IT for career or organizational success. Further, we employed several ex-ante techniques to minimize validity threats associated with common method bias such as three rounds of card sorting and pretesting to ensure clarity, use of different scales for dependent and independent variables, and their temporal, proximal, and psychological separation (Pavlou and El Sawy 2006; Podsakoff et al. 2003).[8]

Sampling and Data Collection

We tested our theoretical model through a survey of employees in North American companies. Data collection was administered by a reputable company that has a broad panel of organizational employees from several companies and industries. Employing data collection companies is a common method for data collection in top management

[8] We performed three ex-post tests (Harman test, latent variable correlation matrix, and marker variable), all indicating no serious concern for method bias (Appendix D).

and psychology journals (e.g., Cameron and Webster 2013). We used a double opt-in procedure to recruit respondents. The company approached respondents through several recruitment channels (including email, phone, and mail), and explained the goal of the study and its conditions based on a script that we provided.

We also screened respondents to meet certain criteria before the start. That is because not all employees work with adaptable technologies and not everyone is allowed to make changes in their tasks. First, we focused on employees who *recently* (i.e., within the last six months) experienced an IT implementation. This is important since IS research shows that most innovative behaviors with technology occur relatively soon after an IT implementation (Ortiz de Guinea and Webster 2013; Tyre and Orlikowski 1994). Second, another screening question was used to ensure that IT implementation had directly changed the way a respondent works (to exclude IT implementations that do not affect users' work such as the installation of a kiosk on the floor of a retail store that may not have a major effect on an employee's work). Third, we excluded employees who were using a restrictive technology (e.g., cash registers in retail contexts). Finally, two screening questions were also designed to ensure that the respondents worked in the context of an organization (as opposed to solo entrepreneurs, for example) and to exclude IT programmers, because our study focuses on IwIT and IU among non-IT specialists. As a result, we developed five screening questions that collectively created a pool of participants in which IwIT can be effectively measured by ensuring that we only include (1) organizational employees (204 participants were eliminated), (2) who are not programmers (54 participants were eliminated), (3) who recently experienced an IT implementation (2057 participants were eliminated), with (4) a technology that was not restrictive (406 participants were eliminated), and that (5) directly changed the way a respondent works (97 participants were eliminated).

Three quality-control questions were also included to ensure that respondents answered our questions carefully (a total of 345 people were eliminated by these attention traps). Reverse-coded questions were used in order to improve the quality of responses. In addition, invisible timers measured the time spent by respondents answering the questionnaire, and we checked for obvious response patterns. Overall, 427 responses in the final data set were obtained with a response rate of 15.02%, which is a typical rate for similar management and psychology research studies (Cameron and Webster 2013; Piccolo and Colquitt 2006). Non-response bias was analyzed by comparing early vs. late respondents across important demographic variables and the key constructs of our study (Pavlou and El Sawy 2006). No evidence of non-response bias was found.

The respondents were using a variety of technologies: application suites such as MS Office or iWork (37%), enterprise systems such as ERPs or CRMs (38%), organizational knowledge bases or social media such as Wikis (12%), product development software such as CAD/CAM or Primavera (9%), or others such as simulation applications (4%). Respondents varied in age and were also from a variety of industries, with a wide range of work experience. Appendix A provides more details about the sample statistics.

Analysis and Results

In our analysis, we use partial least square (PLS) because it (1) allows working with formative constructs (Gefen and Straub 2005; Ringle et al. 2012); (2) is more appropriate for less theoretically developed domains (Chin 2010; Hair et al. 2014); (3) is less sensitive to violation of the normality assumption, which is expected for our dependent variable (Hair et al. 2014); and (4) allows working with smaller sample size. Our theoretical model was tested by employing SmartPLS 3.3, and significance levels were established by 2000 bootstrapped iterations with a sample size of 427.

Prior to running the main analysis, we ran two preliminary tests that include measurement model validity and testing for mediation. All composite measures show high reliability (i.e., Cronbach's alpha and composite reliability were above the threshold of 0.7, see Appendix C) and all factor loadings were also good (all loading above 0.7[9], see Appendix B) (Ringle et al. 2012). For convergent validity and internal consistency, we examined item-to-construct loadings, composite reliability, and average variance extracted (AVE) (Keil et al. 2013). Almost all of the item-to-construct loadings were greater than 0.7 (Appendix B), which indicates that the variance explained exceeds the error variance (Chin 1998). Examination of the cross-loadings of items on other constructs showed that all items load higher on their associated constructs. The cross-loading differences were all higher than 0.2, which is more than the suggested threshold of 0.1 (Gefen and Straub 2005). The values of composite reliability and Cronbach's Alpha were all higher than the recommended threshold of 0.70, and the values of AVE were all above 0.50. These indicate the measurement model's convergent validity (Keil et al. 2013). Discriminant validity was also good as shown by the AVE of each construct, which was larger than its correlation with the other construct and the fact that each item had a higher loading on its assigned construct than on the other constructs (Gefen et al. 2000; Ringle et al. 2012, see Appendix B). In addition, the square root of AVE was larger than the absolute amount of the correlation between a construct and other constructs; this provides additional evidence for discriminant validity (Fornell-Larcker test).

[9] Only one item (PIIT2) was eliminated, which had a low loading of 0.40. This was a justified decision in that (1) it was a control variable and not a key construct of our study, and (2) the other items have high loadings.

Testing for the Structural Model

As illustrated in Figure 3, the result of the SEM analysis supports the differential effect of the three types of motivations on IwIT vs. IU. Our results also show that IS slack only interacts with intrinsic motivation to predict IwIT, but not the other motivations.

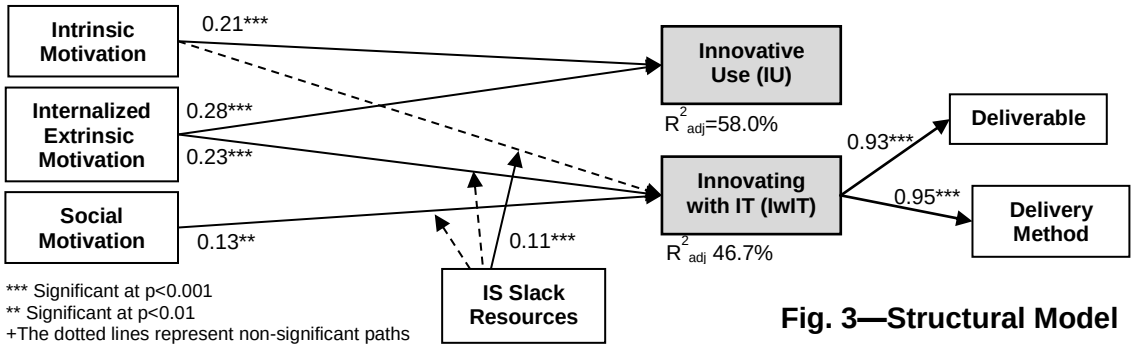


Fig. 3—Structural Model

With regard to control variables, we first draw on the existing literature to only include the effect of control variables related to several individual factors (knowledge of technology, personal innovativeness with IT, age, experience, tenure, education), technology factors (e.g., technology use routinization, or type of IT), and contextual factors (organizational support for innovation) on IwIT/IU and then, added different types of motivations. The effect of some control variables was significant (e.g., knowledge of IT, technology use routinization, organizational support for innovation). Others, including demographic variables, were not significant. With respect to main effects, intrinsic motivation was positively associated with IU (β= 0.21, p<.001, H1 supported), but as expected, not directly with IwIT (β= 0.08, p>.2). Social motivation was associated with IwIT (β= 0.13, p<.01, H2 supported). Internalized extrinsic motivation (i.e., performance expectancy) was positively associated with IU (β= 0.28, p<.001, H4 supported) and IwIT (β= 0.23, p<.001, H3 supported). With respect to moderating effect, IS slack positively interacted with intrinsic motivation to predict IwIT (β= 0.11, p<.000; H5a supported). However, the moderating effect of IS slack on the link between social motivation and IwIT (β= 0.01,

p>.8; H5b not supported); and between internalized extrinsic motivation and IwIT (β= 0.05, p>.2; H5c not supported) were non-significant. Table 4 summarizes the results.

Table 4: Summary of Empirical Results

Variables	Model 1 (controls)		Model 2 (main effect)		Model 3 (moderation)
	DV: IwIT	**DV: IU**	**DV: IwIT**	**DV: IU**	**DV: IwIT**
Encouragement for innovation	β= 0.16***	β= 0.15**	β= 0.11*	β= 0.08	
Personal innovativeness with IT	β= 0.12	β= 0.10*	β= 0.09	β= 0.04	
Routinized use	β= -0.11**	β= -0.05	β= -0.09***	β= -0.05	
Knowledge of technology	β= 0.32***	β= 0.46***	β= 0.24***	β= 0.31***	
Creative IT self-efficacy	β= 0.14**	β= 0.13*	β= 0.07	β= 0.04	
Autonomy	β= 0.04	β= 0.01	β= -0.01	β= -0.04	
Type of IT	β=0.03	β= 0.04	β= 0.04	β= -0.04	
IM → IU (H1)				β=0.21**	
SM → IwIT (H2)			β= 0.13**		
IEM → IwIT (H3)			β= 0.23***		
IEM → IU (H4)				β=0.28***	
Slack * IM → IwIT (H5a)					β= 0.11***
Slack * SM → IwIT (H5b)					β= 0.01
Slack * IEM → IwIT (H5c)					β= 0.05

IM: intrinsic motivation; SM: social motivation; IEM: internalized extrinsic motivation

Post Hoc Analysis

We conducted post hoc analyses to further examine the distinction between IwIT from IU by exploring their relationship with individuals' mindfulness at work. Further, we probed more deeply into the roles of slack resources, and we examined the effects of different types of IS slack resources, and the moderating role of slack in samples with varying levels of personal innovativeness (Li et al. 2013) and for different technologies.

First, for additional nomological validity and credibility to our distinction between IwIT and IU, we examined the effect of the two IT-based innovative behaviors on individual mindfulness at work. As an important individual concept, mindfulness has been increasingly attended by IS scholars (Jensen et al. 2017), as an important measure of individual effectiveness at work. It refers to the state of individuals' conscious awareness and attentional vividness to see more complexities and nuances in their work and the

broader work context and to be receptive to them (Langer 1989; Rerup 2009). Research shows that, on the one hand, IT can enhance mindfulness by "heightening attention through cultivating awareness of IT risks, careful analysis of issues, and increased organizational collaboration, as well as by enriching action repertoires." On the other hand, IT may not lead to mindfulness if used for automation (Sutcliffe et al. 2016, p. 67; Valorinta 2009). Consequently, we expect a positive and significant relationship between IwIT and mindfulness at work, but not between IU and mindfulness. That is because IwIT is outcome oriented, which can significantly enhance individual conscious awareness to nuances and complexities in work outcomes, collaboration in the broader work context (including other colleagues, managers, or clients), and the integrative opportunities and challenges in one's work and its boundaries (De Dreu et al. 2000, 1998). In contrast, IU is process-oriented, inward, focused on internal work processes, and relatively narrow in its innovation type. Thus, IU is not expected to improve mindfulness because it does not necessarily extend individuals' views of work and its integration with other people's work. To examine this, we measured the extent of mindfulness at work when using IT and ran the post hoc analysis. As expected, the result showed that IwIT is significantly and positively associated with employees' mindfulness ($\beta = 0.16$, $p = .01$), yet IU's effect on mindfulness is non-significant ($\beta = 0.01$, $p < .9$). This provides further nomological validity to the differentiation of IwIT from IU, as they differentially mediate the relationship between motivation and mindfulness.

Second, we explored the effect of different types of IS slack resources. While we explored the contingent effect of IS slack as a higher-order perception about available IS resources in the work environment, we can also unbundle IS slack resources to time slack and slack in support IS personnel. We explored the effect of each type of IS slack independently on the main effects. While both slack types independently moderated the

link between intrinsic motivation and IwIT, only time slack was partially significant in moderating the effect of internalized extrinsic motivation on IwIT (β= 0.08, p=.07). Yet, none were significant moderators on the link between social motivation and IwIT. This can be justified by the integral nature of social motivation, which justifies engaging in proactively helping others, without having slack resources.

Third, we split the sample into two categories: application suites (e.g. Microsoft Office, LibreOffice, and iWork) and enterprise systems (e.g., enterprise resource planning or financial systems) as they provide different functionalities to users. We also expect that these two types of IT applications might have distinct effects on different dimensions of work and might be associated with different motivational elements. While enterprise systems provide opportunities for users to change the work deliverables, application suites mostly help with work delivery. Our analysis shows that while the effect of intrinsic motivation on IU remained significant in enterprise systems (β= .20, p=.03); it was non-significant in application suites (β=.19, p=.13). For internalized extrinsic motivation, the effect on IU was significant for both application suites and enterprise systems (innovating in the work process). However, the effect of internalized extrinsic motivation on IwIT became non-significant for application suites (β= .08, p=.4). We also unbundled IwIT to its two subdimensions (deliverable and work delivery); both were non-significant. This shows that when using application suites, internalized extrinsic motivation only affects the work process, not work outcomes. In contrast, all the effects on the two subdimensions of IwIT were significant in enterprise systems, showing they provide opportunities to create new work outcomes. As a robustness check, our multigroup analysis showed that this effect on work delivery method (β_{diff}= .29, p=.02) and deliverable (β_{diff}= .21, p=.04) was significantly stronger in enterprise systems, compared

to application suites. Finally, the effect of social motivation on IwIT was significant for application suites (β= .20, p=.03), but not enterprise systems (β= .08, p=.25).

Finally, to further examine the moderating role of slack, we analyzed the effect of IS slack resources among users who have either high or low innovative personalities. Thus, we split the sample (top 30% vs. low 30%) based on personal innovativeness with IT (PIIT) and explored the moderating role of IS slack resources on the paths between motivations and IwIT. The result shows that the moderating effect of slack on the link between intrinsic motivation and IwIT is significant among low PIIT employees (β= .16, p=.01), but non-significant among high PIIT (β= .05, p>.30). This is an interesting finding that suggests IS slack to be mainly effective in encouraging less-innovative, intrinsically motivated users to engage in IwIT. For the link between social motivation and IwIT, the moderating effect of slack is non-significant for both groups (low and high in PIIT). This finding was repeated for the link between internalized extrinsic motivation and IwIT. These findings show that IS slack is a facilitating condition for translating intrinsic motivations to IwIT but not for nonintrinsic motivations that have extrinsic roots and justifications. More discussion will be presented in the next section.

Discussion and Conclusion

Our research differentiated two types of IT-related innovative behaviors (i.e., IU and IwIT). We examined the effects of intrinsic, social, and internalized extrinsic motivations on IU and IwIT and the moderation effect of IS slack resources. Further, we analyzed how IU and IwIT were related to mindfulness at work, a criterion variable in our study.

Our results indicate that IwIT and IU have different motivational antecedents. IU was mainly driven by intrinsic motivation and internalized extrinsic motivation. The significance of intrinsic motivation combined with the fact that IU is mainly a process-

oriented innovative behavior suggests that users are primarily oriented toward self-development or self-fulfillment (e.g., gratification from work-related playfulness). Intrinsically motivated users limit the scope and impact of the risk associated with innovative behavior with IT (e.g., a supervisor's negative reactions Parker et al. 2006) by making changes within the bounds of existing work structure and its goals (i.e., IU). This would reduce the risk, complexities, and uncertainties faced by a user who is driven by self-interest. In contrast, engaging in IwIT is too risky for an intrinsically motivated user as it affects the work of others and consumes resources allocated for routine tasks for an unsolicited change. Our results showed that both social motivation and internalized extrinsic motivation were significantly associated with IwIT. The significance of social motivation combined with the fact that IwIT is mainly a work-outcome oriented innovative behavior suggests that users employ the novel aspects of IT and extend their efforts to maximize the benefits beyond existing work practices and to new work outcomes (Beaudry and Pinsonneault 2005; Elie-Dit-Cosaque and Straub 2011). Interestingly, our post hoc analyses showed that the effect of internalized extrinsic motivation on IwIT varied significantly depending on the technology: it was significant for enterprise systems, but non-significant for application suites.

We found that the availability of IS slack resources (in time and support) strengthened the link between intrinsic motivation and IwIT. However, contrary to our hypotheses, our findings showed that IS slack resources did not significantly moderate the paths between social and internalized extrinsic motivations and IwIT. One possible explanation could be the fact that the main effects between these two nonintrinsic motivations (that are outcome oriented and instrumental in nature) is largely internally fueled by realizing the value of gaining certain benefits of the system toward goals (in internalized extrinsic motivation) or by an internal sense of integrity and the drive to fulfill core internal values

(in social motivation). Thus, the availability of slack in the external work context is not influential on outcome oriented paths compared to the internally oriented path, which seeks alignment between personal interest and work contribution in an uncertain, exploratory path with no guaranteed outcome. Our post hoc analyses showed that time slack has a significant and positive effect on the link between internalized extrinsic motivation and IwIT.

Finally, our results also showed that IwIT was positively associated with mindfulness at work, but that IU was not significantly related to mindfulness. This provides support to the differentiation of the two constructs.

Implications for Research

Conceptualization of Innovating with IT

Our paper contributes to the literature on IT-related innovative behaviors by conceptualizing IwIT as a proactive post-adoption behavior concerned with work outcomes, rather than the work process (i.e., IU). While past IS research has yielded significant insights into understanding innovative IS use (Hsieh and Wang 2007; Li et al. 2013), not much is known about IwIT that aims at changing *work goals and outcomes*. IwIT in the work is becoming an increasingly important phenomenon with today's adaptable and ubiquitous IT. Employees are often best placed to adapt the technology to the unique features of their work practices and use it to improve those work practices (von Hippel 2002, 2005, Morrison et al. 2000). While our preoccupation with existing work structure and goals (i.e., IU) is understandable for a discipline that is all about IT, our work calls for further attention to IT's contributions to the business side (i.e., IwIT). Our study extends recent research on IU by distinguishing it from IwIT conceptually (in its nature) and empirically (in its antecedents, moderators, and consequences).

Differentiating IwIT from IU may also shed light on the inconclusive results reported in the few studies that explored the effect of motivations on IU (Kankanhalli et al. 2015; Li et al. 2013; Wang et al. 2011). For future research, this conceptual distinction is essential to go beyond incremental adaptations and facilitates understanding, explaining, and predicting users proactively use IT to develop radically new products and services (e.g., Lusch and Nambisan 2015).

Motivational and Expectancy Perspectives of IwIT and IU

Our study extends the existing literature, which is mainly focused on expectancy factors, by employing a motivational approach to IT-related innovative behaviors. Consistent with psychology research (Liberman and Trope 1998; Griffin et al, 2007; Parker et al, 2010), our findings support the significance of motivational factors compared to expectancy factors in IwIT. While both personal innovativeness with IT and creative IT self-efficacy (i.e., the belief that one is generally innovative with IT) were significant in the control model, they became non-significant when the three types of motivations were inserted into the model. This implies the importance of motivation beyond expectancy factors in proactive behaviors with IT. By focusing on motivation, past IS research on understanding expectancy (e.g., Ahuja and Thatcher 2005; Bala and Venkatesh 2016; Sun 2012) and individual antecedents (e.g., Deng et al. 2008; Liang et al. 2015; Schmitz et al. 2016) is extended.

Our study further contributes to IS research by showing the importance of social motivation, which is an understudied motivation in IS. Social motivation contributes to finding integrative opportunities between one's work and others' work (work deliverable and delivery method). We showed that social motivation (i.e., desire to benefit the self and others) is a viable, independent path to IwIT. This may be most applicable after an IT implementation that disrupts work and leads to several unforeseen contingencies in

employees' work. It captures altruistic motives, broadens a user's span of attention to include others, and expends efforts to find momentary, instrumental, quick-win solutions that also benefits others (e.g., De Dreu et al. 2000, 1998, Grant 2008, 2012). We showed that social motivation facilitates IwIT, specifically between work domains, that integrate work deliverables (Barki and Pinsonneault 2005). These are areas that are less attended to by intrinsically driven users who mostly attend to their own areas of interest.

Slack Resources and Innovation

Our paper contributes to the literature on IS resources (Wade and Hulland 2004) and IS slack resources (Rahrovani et al. 2018; Rahrovani and Pinsonneault 2012) by differentiating the notion of IS slack resources from adequate IS resources at the individual level. Our paper contributes to a better understanding of the role of slack resources in IT-based innovations. Despite anecdotal evidence that suggests a universal positive impact of slack on innovation in the work environment, our results showed that allocating IS slack does not facilitate all motivational paths to innovations. IS slack resources enhance users' propensity to engage in IwIT by providing exclusive resources to be consumed by an intrinsically motivated user for changing work goals and outcomes. It promotes users' perceived level of control over managing the unforeseen, emerging consequences of deviating from routines. Future research can explore the effect of other types of slack, such as knowledge slack or technological slack on innovative performance.

Implications for Practice

Our paper offers implications for practitioners (Moeini et al. 2019). For managers, the paper shows that, as management levers, motivations have different effects in encouraging different types of innovations with IT in their work process (IU) or work outcomes (IwIT). Our paper also shows that slack innovation programs (Rahrovani et al.

2018) are not equally effective for all employees. This is an important implication given the expensive nature of such programs. Our findings show that users with social or internalized extrinsic motivation would engage in IwIT with no need for slack. Instead, intrinsically motivated employees need slack to feel safe to go beyond their existing work and innovate in their work outcomes. Our findings extend the existing conversation on slack innovation programs (e.g., Google's 20% innovative time-off policy) by providing a nuanced view of its effectiveness in promoting innovation with IT (e.g., new products and services).

Limitations and Future Research

Our research study has several limitations that could be addressed in future research. First, while proactive innovations are mainly approached as behaviors with positive outcomes, they have also been associated with some personal and organizational costs (Bolino et al. 2013). However, innovative and proactive behaviors have also been related to negative outcomes such as role overload, job stress, job dissatisfaction, and work-family conflicts (Bergeron 2007; Bolino and Turnley 2005). Future research can look at the downsides of IU and IwIT. Second, we excluded affective motivational factors (i.e., "energized to") from our model. While this decision was justified given the distinct nature of affective vs. cognitive-motivational factors and their indirect effect through existing motivational factors, future research can independently develop affective models to explore differences of the effect of "energized to" motivation on IU vs. IwIT. Third, our research adopted a positive view of IS slack. However, slack resources can be associated with some dysfunctions such as creating redundancies and decreasing organizational efficiency (Love and Nohria 2005). Agency theorists challenge the benefits of slack for organizations and argue that slack helps managers to follow their personal goals when they are misaligned with organizational goals through, for example,

excessive diversification or empire building (Tan and Peng 2003). It would be interesting to further study the negative consequences of IS slack on employees. Other approaches such as frugal innovation (Ahuja and Chan 2014, 2016), which assumes a shortage of resources to be the trigger for innovation, could be employed. Future research could investigate how and under what conditions competing theories of slack vs. frugal innovation coexist. As a fourth limitation, our model is more applicable to the work in service or more information-intensive jobs that provide further freedom to users, compared to manufacturing, for example. Finally, and as a methodological limitation, we employed several ex-ante techniques to minimize common method bias and did not find a serious concern by performing three ex-post tests (Harman test, latent variable correlation matrix, and marker variable). Alternative research methodologies or measurement techniques can be used in future research to address potential weaknesses inherent in cross-sectional methods of data collection.

While the paper provides some insight into two different types of innovative behaviors with IT, it also uncovers several new questions that can be addressed in future research. We hope these ideas will stimulate research on the notion of IwIT and that our paper can serve as the theoretical foundation for research on the topic.

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Yasser Rahrovani is an assistant professor in Information Systems in Ivey Business School at Western University (London, Canada). He holds a PhD in Management from McGill University (Montreal, Canada), an MSc in Management from Queen's University (Kingston, Canada) and both a B.Sc. in Electrical Engineering and an MBA from Sharif University of Technology (Tehran, Iran). His research interests focus on innovating with digital innovation and transforming organizations with digital innovation. Yasser has published in the Journal *of Strategic Information Systems (JSIS)*, *MIT Sloan Management Review*, *Communications of the Association for Information Systems (CAIS)*, and *The DATA BASE for Advances in Information Systems*.

Alain Pinsonneault, Fellow-Royal Society of Canada, member of the National Order of Québec, and Fellow of the Association for Information Systems, is a Distinguished James McGill Professor and the Imasco Chair of information systems in the Desautels Faculty of Management at McGill University. His current research interests include the organizational and individual impacts of information technology, user adaptation, business model in the digital economy, e-health, and the business value of IT. His research has appeared in numerous journals, including *Management Science, MIS Quarterly, ISR, the JMIS, Decision Support Systems*, and *Organization Science*. He has served on the editorial boards of several other journals including *MISQ, ISR, Organization Science, and JMIS.*

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Appendix A—Instrument development, Constructs and Measures

In general, all constructs were measured using multi-item scales. IwIT is conceptualized as a higher-order construct reflective of its two dimensions (work deliverable and delivery method). While these dimensions are conceptually distinct, they are not independent. When a user is innovating with IT, these dimensions coexist and are correlated because change in one (e.g., changing the work deliverable) is most likely associated with change in the way it is delivered to a client or colleague (delivery method). As a result, these dimensions reflectively represent IwIT as a second-order concept. IS slack is conceptualized as a second-order formative construct that is based on the presence of slack in IS support personnel and time.

The instruments were validated in three steps. First, the content validity of the new constructs was examined and the construct themes (i.e., its dimensionality, stability, and inclusiveness attributes) were specified. To achieve this, a literature review was coupled with semistructured interviews conducted with nineteen managers and professionals about their innovation with IT. Interviewees included nine users/managers associated with different functions (research and development, marketing, design, project management, and planning) and different industries (energy, insurance, healthcare, video game, and telecommunication) who used IT to innovate in their work. In addition, ten interviews were conducted with employees and managers in an innovation lab of a large company. These interviews were used to assess content validity of the measures of the new constructs, to obtain deeper insights about the phenomenon, to revise the items generated based on the literature, and to adjust our research model. Second, to establish content validity as well as preliminary convergent and discriminant validity, three rounds of card sorting with 18 academic experts were performed in three panels of

six judges. After modifying and eliminating several items in each round, the hit ratio was above the accepted thresholds (i.e., 80% in Moore and Benbasat 1991). Finally, we tested the survey (flow, length, wording, etc.) with four users (representative of our respondents) in different industries who recently experienced an IT implementation in their work environment. Participants completed the survey and were interviewed immediately afterward. This led to several minor improvements in the survey. For example, to ensure that we measure IwIT (with a focus on work rather than technology), the items asked respondents to indicate "the extent to which you use this IT to innovate in your work deliverables by . . . ." Further, each component of work outcomes (i.e., deliverables and delivery method) was underlined in the items and clearly defined in a colorful box to ensure it was read in that section of the questionnaire. Similar improvements were made to items in which subjects provided comments.

Respondents were also from the following industries. service industry (17%), IT and telecommunication (16%), healthcare (11%), retail (10%), education (10%), manufacturing (8%), construction and real estate (7%), and a mix of other industries including automotive, transportation, and energy (21%). More than half of the respondents were top (18%) or middle (46%) managers, and the rest occupied nonsupervisory (36%) positions. The respondents had a wide range of work experience—over 10 years (30%), 6 to 10 years (27%), 3 to 5 years (28%), 1 to 2 years (11%), and less than a year (4%); 55% of them were women. The age groups ranged from 19–25 years old (8%), 26–30 years old (17%), 31–40 years old (32%), 41–50 years old (23%), and 51 years or more (20%). Finally, approximately half of the sample respondents held a bachelor's degree (46%), while others held a master's degree (21%), professional certification (14%), or a high school/diploma or degree (14%).

Table A- Study constructs and mesures			
Definition	**Operationalization**	**Source**	**Measurement instrument**
Innovating with IT A post-implementation that is proactively performed with IT and develops novel changes in one's work outcomes.	IwIT in the **work deliverables**, which refers to products or services one delivers to his/her manager, employees, or clients.	Draws on Aaen's (2008) classification of IT innovations. Items were generated based on service innovation (Dotzel et al. 2013; Sawhney et al. 2003, 2006) and service delivery innovation (Chen et al. 2009) literature.	Indicate the extent to which you used this IT to innovate in your work deliverable by … (1)…modifying of an existing company product/service. (2)…improving the quality of your work deliverables. (3)…customizing your work deliverables to the needs of your clients. (4)…adding new functionalities to your work deliverables. (5)…creating new work deliverables altogether.
	IwIT in the **work delivery**, which refers to the manner by which one's deliverables are made accessible to his/her clients (i.e., customers, employees, or managers	Refined on card sorting (n=18) and pretests (n=4) 5-point Likert scale on a slider measure (*Not at all* to *A great extent*) While one may innovate in one dimension with no change in the other dimensions, the three dimensions of user innovation are not mutually exclusive and can coexist	Indicate the extent to which you used this IT to innovate in your work delivery method by … (1)…delivering your products/services to your clients in an entirely new way (e.g., reporting to other managers on organizational social media). (2)…making it easier and simpler for your existing clients to access to your product/service. (3)…making your product/service delivery more interactive with your existing clients. (4)…making your product/service delivery more responsive and sensitive to your clients' needs and habits. (5)…making your product/service delivery method more integrated into work processes of your existing clients. (6)…making your product/service delivery method more reliable for your existing clients. (7) making your product/service available to new clients (internal or external to the organization)
Playfulness with IT: the degree of cognitive spontaneity in computer interactions		Borrowed from Hess et al. (2005); measured on a 7-point scale (*Strongly disagree* to *Strongly agree*)	When using this IT, indicate to what extent you agree or disagree with the following statements: (1) I am spontaneous, when I am using this IT. (2) I am flexible, when I am using this IT. (3) I am creative, when I am using this IT. (4) I am playful, when I am using this IT.

Perceived IS slack Resources Perceived degree of surplus in a user's IS resources surrounding a certain IT that are beyond what s/he knows as generally necessary to accomplish his or her job.	**Time IS slack:** user's perception of the extent to which s/he possesses an extra amount of time for exploration and innovation.	Drawing on the notion of organizational slack in organizational theory (e.g., Love and Nohria 2005) and IS literature (Rahrovani et al. 2014; Rahrovani and Pinsonneault 2012) Measured as an absolute (vs. relative) and subjective (vs. objective) construct. The items for each type of slack have been developed on a 7-point scale (*Strongly disagree* to *Strongly agree*)	(1) I have been given free time with the mandate to innovate with this IT. (2) I have been given free time for the purpose of experimenting new ideas with this IT. (3) I have had free time specifically to explore my work with this IT. (4) I have been given free time for the purpose of innovating with this IT.
	IS support personnel Slack: user's perception of the extent to which extra IT support personnel is available to help him/her using the new IT (over and above what one perceives to be necessary for doing his/her work).		(1) Extra IT support personnel are usually available upon my request. (2) Availability of extra IT support personnel makes it easy to find help when doing my current job with this IT. (3) I usually get an answer to a problem because there are extra IT support personnel around. (4) When using this IT to do my job, there are more IT support people available than I need.
Intrinsic motivation to innovate: Desire to expend effort on creative use of an IT based on his or her own interest and enjoyment.	Differentiated from intrinsic motivation in task accomplishment, which is general and not related to innovative use of IT in the work.	Adapted from Venkatesh et al. (2003); 7-point scale (*Strongly disagree* to *Strongly agree*)	Indicate to what extent you agree or disagree with the following statements in response to the question of *"Why were you motivated to creatively use this IT in your work?"* (1) Because I find applying this IT in novel ways to be enjoyable. (2) Because the actual process of innovating with this IT is pleasant. (3) Because I have fun exploring new uses of this IT.
Social motivation to innovate: desire to expend effort on creative use of an IT in order to help and benefit others	Differentiated from intrinsic motivation to innovate, in that socially motivated people are driven by other people's needs	Adapted from Grant and Berry (2011) 7-point scale (*Strongly disagree* to *Strongly agree*)	Indicate to what extent you agree or disagree with the following statements in response to the question of *"Why were you motivated to creatively use this IT in your work?"* Because … (1) I care about benefiting others through my work (2) I want to help others through my work (3) I want to have positive impact on others (4) it is important to me to do good for others through my work
Internalized extrinsic motivation: External benefits and contingencies that are internalized as values	The extent to which a person believes that using the system will enhance his or her job performance	Borrowed from Hess et al. (2005); measured on a 7-point scale (*Strongly disagree* to *Strongly agree*)	Indicate to what extent you agree or disagree with the following statements 1.Using this IT improves my performance in my job. 2.Using this IT in my job increases my productivity. 3.Using this IT enhances my effectiveness in my job.
Control variables: *Organizational Encouragement for innovation with technology***:** 4 items measured on a 7-point Likert scale (Durcikova et al. 2011); *Personal IT innovativeness*: as a trait with 3 items measured on a 7-point Likert scale (Ke et al. 2012); *Routine use*: 3 items measured on a 7-point Likert scale (Li et al. 2013); *Demographics*: Age, gender, education degree, tenure, experience, prior knowledge of IT; *IT flexibility* as a marker variable: 3 items measured (Wixom and Watson 2001)			

Appendix B—Factor Analysis

Table B—Factor analysis

	ENCG	IM	IwIT	KN	PIIT	SM	IU	RTN	SLKSup	SLKTi	PE
ENCG 1	0.82	0.53	0.41	0.48	0.48	0.40	0.39	-.09	0.38	0.44	0.40
ENCG 2	0.85	0.43	0.38	0.43	0.35	0.42	0.31	.01	0.40	0.47	0.36
ENCG 3	0.83	0.42	0.42	0.41	0.33	0.44	0.34	-.01	0.42	0.43	0.42
ENCG 4	0.73	0.43	0.28	0.34	0.28	0.28	0.29	-.02	0.33	0.47	0.36
IM 1	0.50	0.93	0.46	0.59	0.52	0.45	0.50	-.07	0.48	0.56	0.53
IM 2	0.56	0.95	0.54	0.62	0.50	0.49	0.53	-.07	0.50	0.61	0.62
IM 3	0.51	0.95	0.51	0.58	0.54	0.50	0.50	-.02	0.47	0.57	0.60
IwITDel 1	0.32	0.35	0.71	0.41	0.34	0.32	0.37	-.09	0.39	0.39	0.43
IwITDel 2	0.36	0.43	0.79	0.48	0.36	0.39	0.39	-.12	0.42	0.41	0.48
IwITDel 3	0.40	0.51	0.82	0.49	0.38	0.38	0.44	-.09	0.43	0.46	0.51
IwITDel 4	0.36	0.40	0.79	0.44	0.40	0.37	0.38	-.05	0.42	0.34	0.44
IwITDel 5	0.39	0.45	0.79	0.46	0.37	0.36	0.42	-.07	0.47	0.42	0.46
IwITMeth 1	0.36	0.45	0.78	0.44	0.41	0.38	0.42	-.13	0.41	0.38	0.42
IwITMeth 2	0.38	0.47	0.82	0.49	0.42	0.42	0.43	-.10	0.44	0.49	0.43
IwITMeth 3	0.42	0.44	0.82	0.47	0.40	0.38	0.37	-.06	0.45	0.43	0.39
IwITMeth 4	0.42	0.43	0.83	0.48	0.40	0.34	0.42	-.12	0.48	0.44	0.43
IwITMeth 5	0.40	0.41	0.82	0.45	0.35	0.39	0.39	-.16	0.41	0.35	0.43
IwITMeth 6	0.41	0.44	0.83	0.49	0.39	0.41	0.44	-.11	0.46	0.42	0.45
IwITMeth 7	0.39	0.41	0.79	0.43	0.39	0.33	0.37	-.14	0.43	0.47	0.39
Kn 1	0.40	0.55	0.48	0.84	0.47	0.34	0.47	-.04	0.47	0.50	0.49
Kn 2	0.44	0.52	0.48	0.87	0.48	0.35	0.47	-.06	0.45	0.52	0.49
Kn 3	0.42	0.58	0.53	0.86	0.50	0.37	0.50	-.10	0.50	0.56	0.49
Kn 4	0.45	0.55	0.44	0.81	0.45	0.34	0.48	0.04	0.45	0.50	0.44
Kn 5	0.41	0.43	0.45	0.74	0.40	0.36	0.39	-.03	0.40	0.42	0.42
PIIT 1	0.36	0.47	0.43	0.49	0.91	0.42	0.37	-.05	0.29	0.35	0.42
PIIT 3	0.46	0.54	0.45	0.54	0.92	0.45	0.39	-.13	0.34	0.45	0.43
SM 1	0.47	0.51	0.43	0.42	0.47	0.90	0.32	-.03	0.36	0.37	0.47
SM 2	0.43	0.43	0.39	0.38	0.38	0.90	0.28	-.05	0.30	0.32	0.42
SM 3	0.42	0.44	0.41	0.37	0.43	0.92	0.28	-.06	0.33	0.34	0.45
SM 4	0.42	0.45	0.43	0.36	0.43	0.89	0.28	-.03	0.34	0.33	0.44
IU 1	0.31	0.54	0.40	0.49	0.42	0.31	0.85	-.04	0.35	0.48	0.52
IU 2	0.35	0.50	0.41	0.47	0.39	0.30	0.87	-.10	0.41	0.48	0.48
IU 3	0.34	0.50	0.36	0.43	0.34	0.26	0.83	-.03	0.31	.49	0.42
RTN 1	0.00	-.04	-.10	-.04	-.08	-.02	-.04	0.88	-.04	-.04	0.02
RTN 2	-0.07	-.08	-.12	-.07	-.10	-.08	-.08	0.94	-.06	-.08	-.04
RTN 3	-0.02	-.04	-.16	-.04	-.08	-.03	-.06	0.94	-.10	-.10	0.03
SLKSupp 1	0.41	0.44	0.47	0.46	0.31	0.37	0.39	-.08	0.91	0.52	0.37
SLKSupp 2	0.44	0.48	0.52	0.51	0.33	0.34	0.45	-.07	0.92	0.57	0.43
SLKSupp 3	0.43	0.43	0.51	0.51	0.32	0.35	0.41	-.07	0.92	0.55	0.43
SLKSupp 4	0.40	0.48	0.44	0.50	0.27	0.25	0.43	-.04	0.83	0.58	0.41
SLKTi 1	0.49	0.56	0.47	0.56	0.40	0.32	0.47	-.07	0.58	0.93	0.46
SLKTi 2	0.51	0.55	0.51	0.54	0.40	0.35	0.48	-.10	0.56	0.93	0.45
SLKTi 3	0.51	0.59	0.49	0.58	0.40	0.35	0.48	-.07	0.59	0.93	0.46
SLKTi 4	0.55	0.60	0.48	0.58	0.42	0.38	0.50	-.07	0.58	0.94	0.47
PE 1	0.42	0.55	0.50	0.48	0.42	0.47	0.49	-.01	0.39	0.43	0.90
PE 2	0.38	0.54	0.46	0.50	0.39	0.37	0.46	0.00	0.40	0.44	0.87
PE 3	0.45	0.52	0.51	0.48	0.39	0.43	0.47	-.01	0.41	0.43	0.88
PE 4	0.42	0.58	0.49	0.54	0.43	0.47	0.48	0.04	0.41	0.44	0.87

ENCG: Perceived organizational encouragement for innovation; **SLKSup**: IS support personnel slack; **SLKTi**: Time IS slack; **Kn**: Knowledge of the IT; **IwIT:** Innovating with IT (**Delv**: work deliverable; **Meth**: work delivery method); **IM**: Intrinsic motivation; **SM**: Social motivation; **PE:** Performance expectancy; **PIIT**: Personal innovativeness with IT; **RTN**: Routine use

Appendix C—Interconstruct Correlations and Reliability

Table C- Correlation matrix, composite reliability and Cronbach's Alpha													
	Mean	STD	ENCG	IM	IwIT	Kn	PIIT	RTN	SM	PE	Ti	Spp	IU
ENCG	5.45	1.07	0.72										
IM	5.26	1.30	0.56	0.88									
IwIT	3.26	0.94	0.47	0.53	0.58								
Kn	5.37	1.06	0.51	0.64	0.58	0.73							
PIIT	5.46	1.20	0.45	0.55	0.48	0.56	0.84						
RTN	5.89	1.06	-0.03	-0.06	-0.14	-0.05	-0.09	0.85					
SM	5.92	0.91	0.48	0.51	0.46	0.42	0.48	-0.05	0.81				
PE	5.76	0.95	0.47	0.62	0.55	0.57	0.46	0.00	0.49	0.78			
Ti	4.81	1.55	0.52	0.62	0.53	0.61	0.43	-0.08	0.37	0.49	0.87		
Supp	4.95	1.44	0.47	0.51	0.55	0.55	0.34	-0.08	0.37	0.46	0.62	0.80	
IU			0.49	0.63	0.60	0.64	0.49	-0.07	0.38	0.63	0.61	0.56	
Age			0.03	0.06	0.12	0.08	0.13	0.04	0.04	0.06	0.00	0.08	0.04
Deg			0.04	-0.03	-0.07	-0.03	-0.03	0.08	-0.08	-0.06	-0.04	-0.08	0.01
Gen			-0.08	-0.08	0.03	-0.04	-0.05	-0.15	-0.02	-0.02	-0.08	-0.02	-0.05
ITyp			0.02	0.02	0.03	-0.04	0.02	-0.05	0.02	-0.04	-0.04	-0.05	-0.05
LvL			-0.10	-0.13	-0.08	-0.12	-0.15	-0.12	-0.04	-0.16	-0.14	-0.04	-0.10
Ten			0.05	0.10	0.11	0.08	0.07	-0.02	0.09	0.07	-0.03	0.00	-0.01
α			0.82	0.93	0.96	0.88	0.80	0.91	0.92	0.91	0.95	0.92	0.80
CR			0.88	0.96	0.96	0.91	0.91	0.94	0.95	0.93	0.96	0.94	0.89

St Dev.: Standard deviation; **Spp**: IS support personnel slack; **Tech**: Technological IS slack; **Time**: Time IS slack; **Kn**: Knowledge of IT; **IM**: Intrinsic motivation; **SM**: Social motivation; **PE:** Performance expectancy; **ENG**: Organizational encouragement for innovation with technology; **PIIT**: Personal innovativeness with IT; **AUT**: Autonomy; **Eff**: Creative IT self-efficacy; **RTN**: Routine use; **Edu**: Education; **Exp**: Experience; **GND**: Gender; **LVL**: Organizational level, **TNR**: Tenure; **α**: Cronbach's Alpha; **CR**: Composite Reliability. **STD.**: Standard deviation. The diagonal elements are square roots of AVEs (>0.7); Off-diagonal elements are the correlations among latent variables.

Appendix D—Common Method Bias

We employed three statistical methods to test whether common-method bias was a threat to the study's result and conclusions. First we conducted the Harman single-factor test (Podsakoff et al. 2003), a diagnostic test for common method variance (Sharma et al. 2009). All the main and control variables of the study were entered into an exploratory factor analysis using SPSS's unrotated principle component factor in order to determine the number of factors necessary to account for explaining the variance. The Harman test extracts ten factors with eigenvalues over 1.5 and 61.5% as the total variance explained. The result showed that the highest factor contributed 29%. This did not account for the majority of the variance and was less than the threshold of 50%

(Messerschmidt and Hinz 2013). This was against common factor bias (Pavlou and El Sawy 2006).

Second, we examined the latent variable correlation matrix. Common method bias could be an issue if there was a very high correlation (around 90%) among the latent variables. As shown in Appendix C, the highest correlation in the matrix was 0.64. We also checked inner VIF values which were all below 3.3. This shows no significant concern for common method bias (maximum 2.7). Third, we used a more rigorous approach which is a correlation-based marker variable method (Keil et al. 2013; Lindell and Whitney 2001; Malhotra et al. 2006; Podsakoff et al. 2012). According to the regression-based marker variable technique by Siemsen et al. (2010), the common method bias is significantly reduced when the number of independent variables increases in multivariate regression models (Podsakoff et al. 2012). Thus, we added a marker variable, IT flexibility (Wixom and Watson 2001), in the model that directly connected to the dependent variable (i.e., IwIT and IU). The addition of the marker variable in the model led to no gains or losses in the significant and insignificant relationships compared with the model with no marker variable (Table D). Overall, based on the four statistical tests, we conclude that common method bias was not a serious threat to this study.

Table D—Marker Variable Analysis to Evaluate Common Method Bias

	Baseline model			Marker variable model		
	Est.	Standard dev.	P value	Est.	Standard dev.	P value
IM→IU	0.212	0.068	0.002	0.208	0.066	0.002
SM→IwIT	0.119	0.049	0.015	0.107	0.047	0.023
IEM→IwIT	0.244	0.051	0.000	0.232	.051	0.000
IEM→IU	0.282	0.048	0.000	0.272	0.048	0.000

IM: intrinsic motivation; **SM:** social motivation; **IEM:** internalized extrinsic motivation (i.e., performance expectancy)