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A Multilevel Approach to Examine Employees' Loyal Use of ERP Systems in Organizations

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over 200 papers on various topics related to innovation and technology management, human factors in information technology (IT), strategic IT planning, software quality management, and information systems management.

ABSTRACT: A successful enterprise resource planning (ERP) system ultimately requires loyal use—proactive, extended use and willingness to recommend such uses to others—by employees. Building on interactional psychology literature and situational strength theory, we emphasize the importance of psychological commitment, in addition to behavioral manifestation, in a multilevel model of loyal use. Our empirical test of the model uses data from 485 employees and 166 information system professionals in 47 large Taiwanese organizations. Individual-level analyses suggest that perceived benefits and workload partially mediate the effects of perceived information quality (IQ) and system quality (SQ) on loyal use. Cross-level analyses show that IQ at the organizational level alleviates the negative effect of an employee's perceived workload on loyal use; organization-level SQ and service-oriented organizational citizenship behaviors (SOCBs) of internal information systems staff reduce the influence of employees' perceived benefits. Overall, our findings suggest that IQ, SQ, and SOCBs at the organizational level influence employees' loyal use in ways different from their effects at the individual level, and seem to affect individuals' cost-benefit analyses. This study contributes to extant literature by considering the SOCBs of the internal information systems group that have been overlooked by most prior research. Our findings offer insights for managers who should find ways to create positive, salient, shared views of IQ, SQ, and SOCBs in the organization to nourish and foster employees' loyal use of an ERP system, including clearly demonstrating the system's utilities and devising viable means to reduce the associated workload.

KEY WORDS AND PHRASES: information quality, loyal use, multilevel analysis, perceived benefits, perceived workload, service-oriented organizational citizenship behaviors, system quality.

System success is a growing challenge for organizations that deploy an expanding array of enterprise systems and require employees to use them. Particularly important is employees' use of an information system (IS), which is critical to an organization's ability to harness the system's full benefits and thus requires the organization to address key issues surrounding system use [34]. Broadly, system use involves three fundamental elements: people as subjects that use the system, features that serve as components of the system, and tasks that constitute the functions achieved by people using the system [21]. Accordingly, system use can be categorized as the interplay of people, the system, and tasks; it is embodied in individual uses of a system's features and functionalities, constrained by the system or organizational conditions related to system use, as well as the coherence (or lack thereof) between system use and task requirements.

Previous research notes different system uses, including initial, continuance, and extended (or deep) uses. Initial use is the first-time adoption of a system [85]. Continuance of use refers to people's ongoing use of an IS, such that it reflects a postadoption behavior beyond initial acceptance [14, 57, 58].¹ Compared with initial

use, continuance of use arguably is more important for organizations, because infrequent or ineffective subsequent uses of an implemented system incur undesirable costs and may imply wasted efforts [14]. People could be persuaded to engage in initial early uses of a newly implemented IS, but the system's benefits cannot be realized without continued sustained use. Finally, extended use denotes a person's adoption of more system features and functionalities to support work tasks and performance [46]. Extended use coincides with deep use, or the extent to which a person employs different system functionalities to perform various tasks [49, 59]. A logical progression of system use over time seems to exist: acceptance signifies initial use, routinization reveals continuance of use (i.e., routine system use as a normal activity), and infusion relates to extended or deep system use.

Previous studies typically adopt a behavioral orientation to investigate observed system use behaviors in a particular context. However, psychological commitment has been largely overlooked, even though extended or deep use somewhat assumes individuals' psychological commitments to an IS. In general, psychological commitment refers to a person's tendency to resist change, even in response to conflicting information or experiences [30]. When a positive factor, such commitments relate to employees' involvements in the organization, beyond their basic job requirements, and therefore constitute a crucial dimension of loyalty. Employees' psychological commitments to an IS are crucial to its ultimate success in the organization [33]. For example, employees with strong psychological commitments are more likely to seek to use an enterprise resource planning (ERP) system in ways that go beyond the basic mandate of the organization. The significance of psychological commitment thus suggests the need to examine loyal use, which implies an employee's proactive, extended use of an implemented system in the organization, and a demonstrated willingness to recommend such uses to others.

Loyal use resembles customer loyalty [32]; it encapsulates both behavioral and psychological (attitudinal) dimensions that jointly form the construct. When exhibiting loyal use, employees expand their uses of an ERP system by proactively exploring and experimenting with more system features/functionalities for a wider range of work tasks/activities, and willingly recommend such uses to coworkers [49]. Widespread loyal use creates favorable norms and shared views in an organization, which positively affect employees' system assessments and uses.

Although firms invest substantial resources to implement ERP systems, and often mandate that employees use them in work tasks, many struggle to harness their full benefits [49]. We seek to explain this discrepancy from the lens of loyal use. That is, after an ERP system becomes available in an organization, employees can still exhibit inertia, passive reluctance, or subconscious resistance, despite administrative mandates for its uses. The disparity between the system's potential benefits and the actual benefits the organization accrues can thus be explained, at least partially, by employees' loyal uses of the system. As Brown et al. note, "employees who do not wholeheartedly accept the innovation can delay or obstruct the implementation, and resent, underutilize, or sabotage the new system" [18, p. 284].

Whereas most previous research examines the use of a (new) system by focusing on individual- or organizational-level factors, we take a multilevel approach and elaborate

on the essential interplay of important factors. By considering the interactions of key factors at both individual and organizational levels, our approach provides a fuller depiction of employees' loyal uses of an ERP system. We explicitly consider service-oriented organizational citizenship behaviors (SOCBs) by the firm's internal IS staff, which might influence employees' loyal use of the ERP system as well. While SOCBs generally refer to how service personnel treat customers [13], we emphasize SOCBs from internal IS professionals to other employees, to describe the provision of support and services that employees need to use the systems in an organization.

Literature Review

We review representative studies in several research streams, including uses of information systems, voluntary versus mandatory system use, and system success, to highlight the gaps that motivate our investigation.

Uses of Information Systems Usage

Considerable previous research examines initial system use by proposing and testing models to explain how people decide whether to use a new IS shortly after its implementation or their user training. Social psychology offers a common theoretical premise, as manifested in the theory of reasoned action [39] and theory of planned behavior [3]. Salient models include the technology acceptance model [31] and unified theory of acceptance and use of technology [87]. Despite their different perspectives and specific details, these models link perceptions and intentions to use. Furthermore, they all reveal a rational orientation: When deciding whether to use a system, people assess the associated benefits and costs [78], in line with rational choice theory [38].

To realize the benefits of an implemented system, organizations must encourage employees to move beyond initial acceptance (use) to continuance of use [57]. Building on expectation disconfirmation theory, Bhattacharjee [14] proposes an IS continuance model in which people's intentions to continue using a system depend on the extent to which their initial expectations are confirmed by their actual usage experience. Venkatesh and Goyal [86] also consider how disconfirmation, positive or negative, determines continuance of use. In studies of extended or deep use, which occurs when people use an IS beyond a basic set of system features or tasks, Hsieh and Wang [46] propose and test an explicative nomological network that combines the IS continuance model [14] and the technology acceptance model [31].

Conceivably, continuance of use relates to a suite of postadoption behaviors, such as continuance, routinization, infusion, adaptation, and assimilation. For example, continuance of use could indicate merely maintaining initial patterns of system use (i.e., status quo) or reveal escalating system utilization that transcends conscious behaviors and becomes a greater part of work tasks or performance [14]. Continuance of use conceivably evolves longitudinally and therefore requires a series of system use decisions that become increasingly habitualized [57].

Jaspersen et al. [49] describe postadoption behaviors as progressive feature adoption decisions, utilization, and extension behaviors. After the organization implements an IS, people decide whether to adopt [85], and those decisions signal their acceptance of system use as a means to conduct work tasks, whether voluntarily or mandatorily. As people routinely use the system in their work tasks, in the habitualized stage, they could start to proactively explore and extend their system uses to more features or tasks. Such progressive decisions occur somewhat voluntarily, even if employees' initial uses are resulted from an organizational mandate.

Typically, an IS offers more features and functionalities than are required for an employee's basic work tasks. After gaining sufficient experiences with some system features, employees can engage in increased feature use or even feature extension, employing the system in more tasks and activities beyond the mandated ones [59], or both. According to structuration theory [41], human agents usually intervene to use or modify technology structures (e.g., applying an information system's features and functionalities in work tasks) and organizational structures (e.g., task designs, workflows and processes, social structures), as both objective and subjective aspects of their social reality [41]. People often make sense of such interventions in idiosyncratic ways to enact their cognition, which then determines their postadoption behaviors by serving as inputs to both work system outcomes and technology sensemaking [68].

In Appendix A [found as online supplemental data], we summarize representative studies that examine different types of system use. These studies focus primarily on behavioral manifestations, regardless of the particular type of system use they examine. Psychological commitment, crucial for encouraging employees to extend beyond routine, status-quo uses into proactive exploration and exploitation, is seldom considered. For example, Hsieh and Wang [46] study the extended use of an ERP system, in the form of voluntary uses of more system features to support job performance, but do not consider the psychological (attitudinal) aspect. Burton-Jones and Straub [22] emphasize the contextualization of system use, in terms of structure and functions, but without explicitly integrating psychological commitments. Dennis et al. [35] explore loyal use as routine, continued uses of an implemented IS in the organization. A review of previous system use research indicates the need for further conceptualizations of loyal use and examinations of its key determinants.

Voluntary Versus Mandatory System Use

A person's use of an IS in a particular context can be classified as voluntary or mandatory. Voluntary use refers to a situation in which people have substantial autonomy and flexibility in deciding whether to use a system, so the observed uses manifest their perceptions and evaluations of the system. Thus, the extent to which use is voluntary indicates the degree to which people perceive that they have free will in using the system, rather than its being mandated. In contrast, mandatory use implies that people must use a system to perform their jobs [18]. When so

mandated by the organization, employees have no choice but to use a system in their work tasks.

Most previous research focuses on voluntary system use. The essential forces that affect people's voluntary system uses however may differ from those influential in mandated use situations that are common in many organizations [18]. For example, Venkatesh and Davis [85] test an extended technology acceptance model in both voluntary and mandatory use settings and report that subjective norms have direct effects on intention in mandatory but not voluntary contexts, which may help explain the limited effect of social influences in voluntary use contexts in previous research. Venkatesh et al. [87] also examine the moderating role of environment-based voluntariness and find similar results: subjective norms and social factors exert stronger effects in mandatory use settings than in voluntary ones.

When the use of a system is mandatory, a common assumption predicts little variance in usage, such that system use might appear to be a less important indicator of system success. In actuality, people can exhibit notably distinct use behaviors in the same mandatory setting [46]; the complexity and malleability of an information system support nontrivial differences in the scope or sophistication of individual uses [22]. For example, employees mandated to use an ERP system can vary in the breadth and depth of their system use; some employees routinely use the system at the basic level prescribed by the organization while others proactively apply more system features to a wider array of tasks [46, 60]. In this light, mandatory use behavior is variable and thus predictable. This voluntariness, coincident with mandatory system use, also echoes the importance of examining employees' loyal uses of a mandatory ERP system in the organization.

System Success and Key Determinants

DeLone and McLean [33] offer a thorough review of representative studies examining different aspects of system success in organizations. Their proposed IS success model highlights the importance of system use and identifies information quality (IQ) and system quality (SQ) as crucial determinants. IQ refers to the degree to which information provided by a system successfully conveys intended meanings to users in the focal context [33]; it indicates a system's ability to produce and deliver accurate, complete, interpretable information, in an effective and timely manner, with respect to the user's requirements, tasks, or performance [33]. SQ denotes the degree to which a system can produce information efficiently and accurately [33]; it reveals whether the system possesses the characteristics, features, functionalities, and designs required for its intended purpose [65]. The significance of IQ and SQ for system success resonates with a utilitarian view, in that they relate to a system's usefulness and ease of use, respectively [34].

An extension of the IS success model includes service quality as another crucial antecedent [34]. In this vein, internal IS staff play a dual role as information providers and service providers. Service quality depicts the level of services

provided by internal IS staff to other employees in the organization, which should significantly influence those employees' assessments and uses of an IS [70]. When interactions between employees and IS staff increase and intensify, due to greater reliance on information systems to complete tasks, the internal IS group's service quality becomes a crucial determinant of system success [34]. Many previous studies assess (internal) IS services, typically according to the SERVQUAL dimensions [70], but few consider voluntary service behaviors by internal IS staff and their effects on employees' system evaluations and uses.

Organ views organizational citizenship behavior (OCB) as "an individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and that in the aggregate promotes the effective functioning of the organization" [67, p. 4]. OCBs include altruism, courtesy, conscientiousness, sportsmanship, or civic virtue; such behaviors imply that people act with the collective good in mind and promote a sense of belonging. Bettencourt et al. [13] extend OCB by proposing SOCBs, performed by boundary spanners in an organization, who represent the organization to outsiders, link internal operations with customers, and provide services with direct effects on customers. In this light, internal IS professionals also are boundary spanners, because their service behaviors toward employees influence internal customers' assessments and uses of an ERP system. Such discretionary behaviors can define the service quality of internal IS personnel, though it is usually difficult to specify the full range of system-related problems or information needs of various work groups and departments in advance. While SOCBs exist at the individual level, aggregated SOCBs at the organization level also likely affect employees' assessments and behaviors [67].

When customer-contact personnel engage in OCB and provide services in a proactive, effective, and timely manner, customer loyalty increases [75]. According to the service-profit chain [43], loyalty toward an ERP system can arise in a similar way when internal IS staff creates values for employees by delivering high-quality services. Indeed, the SOCBs provided by internal IS professionals, as a team, then might constitute a social context that shapes the interactions of employees and the ERP system. Carr [24] recognizes the importance of considering the high-touch aspects of technology-centric functions by internal IS staff (i.e., service quality) to explain employees' uses of an ERP system, yet the question of how the SOCBs of the internal IS group affects employees' loyal uses of a mandatory ERP system remains uninvestigated.

In summary, our literature review reveals several gaps. First, loyal use has not received sufficient attention. Although closely related to extended or deep use, loyal use explicitly involves psychological commitment, in addition to its behavioral manifestations. Second, previous studies of ERP system use by employees tend to overlook the interaction of key factors at individual and organizational levels. For example, previous research that considers IQ and SQ at the individual level seldom concurrently assesses their aggregate effects at the organizational level, even though they could influence employees' system assessments and use as well. Third, the

SOCBs of internal IS staff have not been considered, despite their effects on employees' evaluations and uses of an ERP system. To address these gaps, we take a multilevel approach, grounded in interactional psychology and situational strength theory, to explain employees' loyal use of a mandatory ERP system. By simultaneously considering organizational factors at the macro level (i.e., organization-level IQ, SQ, and SOCBs), which emerge from individual assessments and perceptions at the micro level (i.e., employees' assessments of IQ, SQ, and SOCBs), we explicate how key factors at different levels interact to jointly explain loyal use.

Conceptualization of Loyal Use of a Mandatory ERP System

Loyal use resembles loyalty conceptually and is critical to the ultimate success of an IS in the organization. Oliver [66] describes loyalty as a deeply held commitment to repurchase a product or repatronize a service consistently in the future, despite situational influences or marketing efforts that prompt switching behaviors. Early conceptualizations of loyalty emphasize its behavioral aspect and rely on observed, repeated behaviors, such as repurchase or reconsumption [47]. However, Day [32] argues that truly loyal customers also must hold favorable attitudes toward the focal offering, in addition to making repeated purchases, and therefore calls for a better reconciliation of behavioral and attitudinal aspects. For example, measuring loyalty only as repurchase behaviors cannot distinguish (true) loyalty from spurious loyalty. Jacoby and Chestnut [47] also caution against a behavior-centric view of loyalty in that observed, repeated purchase behaviors might reflect only the underlying consumption patterns or usage situations.

Refined conceptualizations then recognize that true loyalty exists when people demonstrate both repurchase behavior and psychological commitment to a product, service, or brand [30]. Psychological commitments encompass people's attitudinal beliefs toward a product's superiority, as well as their positive, accessible reactions to that product. Such commitments can separate loyal use from continuance of use that predominantly emphasizes behavioral manifestations [32, 47]. The rigorous and integrated nature of an ERP system requires discipline from employees, involves changes in their workflows, and demands additional documentation tasks; thus, employees may exhibit some resistance and seek a minimal level of system use. But loyal users likely explore more system features and functionalities proactively, similar to loyal customers who are willing to expand their purchases from their preferred store, even at a higher cost. Furthermore, human agents can enact a technology artifact in ways not imagined by technology developers [36]. Through the social influences of essential referents and opinion leaders for example, employees may grow motivated to engage in improvised learning, share their knowledge and experiences in informal ways, and opt to interact with an ERP system more competently [16]. If employees must use an ERP system but also are resourceful enough to overcome its material constraints, they likely become motivated to explore and expand their use of the system. Therefore, beyond basic levels of

compulsory use, employees have nontrivial discretion in exploring system features and functionalities for various tasks and activities, which suggests voluntariness in a mandatory use context.

Loyal customers are proactive advocates who voluntarily spread positive word of mouth about the offering and willingly encourage others to use it [91]. The willingness to engage in positive referrals for a product or service clearly signals a person's psychological commitment to the product or service [91]. Motivated by the value they receive, loyal customers often share favorable product (or service) experiences and reviews with others [12, 91]. Similarly, employees exhibiting loyal use should demonstrate their psychological commitments, through their willingness to recommend proactive, extended uses of an ERP system to others.

This more complete view of loyal use therefore encompasses two related but distinct dimensions (i.e., behavioral and psychological), which we can measure through employees' proactive, extended uses of a system and willingness to engage in positive word-of-mouth recommendations of such uses to others, respectively. General guidelines for a formative measurement model suggests the indicators to be the defining characteristics of the focal construct, such that they need not be interchangeable or they are different in their antecedents and consequences [48]. Accordingly, we conceptualize loyal use as a formative construct, congruent with previous research considering loyalty as a complex, multidimensional phenomenon that cannot be fully assessed with a unidimensional, behavioral measure [54].

Despite its importance, employees' loyal use of a mandatory ERP system has received little attention in previous research. Most prior studies target initial or continuance of use, examining factors at organizational or individual levels separately [46]. Only few exceptional studies indicate that employees' loyal use of a mandatory ERP system depends simultaneously on factors that pertain to individual users, the system, and the organization (e.g., [74]). Because employees often use an ERP system to coordinate with coworkers and complete tasks, their loyal use likely depends on both their own assessments and influential forces at the organization level. We therefore explain employees' loyal use of a mandatory ERP system from a multilevel view.

A Multilevel View of Loyal Use: Theoretical Foundation

A person's behavior is a function of individual-specific internal forces and external forces in the environment [55]. Individual characteristics and contextual (organizational) factors thus jointly determine people's attitudes, cognitions, and behaviors. The organizational context is essential to understanding employees' (motivated) behaviors, because it influences their assessments and steers their behaviors [50]. As Mowday and Sutton note, contexts are "stimuli and phenomena that surround and thus exist in the environment external to the individual, most often at a different level of analysis" [64, p. 198]. In general, individual-level factors provide a micro perspective, rooted in psychology, to explain

people's behaviors according to variations in individual characteristics and evaluations. Organizational factors instead offer a macro perspective, often grounded in sociology, which emphasizes the regularities in social behaviors that transcend individual differences. IQ, SQ, and SOCBs are crucial to the success of an IS [34] and their importance exists at both individual and organizational levels. Therefore, a multilevel approach that bridges these micro and macro perspectives might better explain employees' loyal use of a mandatory ERP system by specifying how IQ, SQ, and SOCBs at the organizational and individual levels interact, through bottom-up and top-down processes [52]. Overall, a bottom-up process describes how individuals' perceptions and assessments aggregate to form collective perceptions and shared views in the organization; the top-down process depicts how collective perceptions and shared views influence individuals' assessments and behaviors.

Bottom-Up Process

The bottom-up process describes the establishment of IQ, SQ, and SOCBs at the organizational level. As Kozlowski and Klein explain, many organizational phenomena have collective properties that emerge at higher levels, through "social interaction, exchange, and amplification" [52, p. 15]. The emergence of IQ, SQ, and SOCBs at the macro level can thus be understood in accordance with social information processing theory, which suggests that a person's attitude or behavior is influenced by other people who have been exposed to similar environmental cues [73]. In an organization, people form their attitudes on the basis of "social information—information about past behavior and about what others think" [73, p. 224], then use that information to interpret events, practices, values, or norms in the organization.

When faced with the mandatory use of an ERP system, employees develop their own perceptions and assessments of its SQ and IQ, which may be idiosyncratic even though they use the same system. Because employees are interconnected by job tasks and workflows defined in an ERP system, their idiosyncratic evaluations also may coalesce, through frequent interactions and exchanges. Such connectedness and interdependency suggest a state of collective system use [21], which provides a basis from which organization-level IQ and SQ can emerge. Also, SOCBs within the IS group can emerge in a similar way. For example, IS staff gather and interpret essential cues from colleagues by observing, interacting, and working with them; over time, they likely develop shared perceptions and expectations of their own service behaviors and outcomes. When IS professionals behave more homogeneously, it leads to collective SOCBs at the group level. If they interact with IS professionals who consistently demonstrate SOCBs, employees become exposed to similar cues and converge in their perceptions, toward a shared view of the group's SOCBs.

This bottom-up process also reflects social learning theory [8], which states that individual behaviors are determined by the environment and their own motivation to learn from essential social referents in that environment. People engage in vicarious learning by observing others, which helps them avoid unnecessary, costly errors [8]. For example, people strive to emulate referent or role models in the organization; prevalent normative behaviors serve as models and thereby affect individuals' evaluations and attitudes as they learn to engage in specific behaviors, by observing how their social referents behave [88]. Coworkers constitute essential social referents. Employees discover, learn, and accept prevalent, normative behaviors by observing and interacting with their coworkers, which may lead to the creation of shared views of an ERP system's IQ and SQ at the organizational level. Similar social learning can take place within the IS group: when internal IS professionals maintain systems and service employees in system uses, they also engage in social learning by observing and interacting with their peers. In turn, model service behaviors can emerge among IT staff members, resulting in shared perceptions of the internal IS group's SOCBs by employees who receive technology-related services from the group.

Thus, IQ, SQ, and SOCBs at the organization level originate with individuals, yet they differ from individual perceptions and assessments, in that they denote and convey collective, shared views in the organization that emerge only after individual perceptions reach some level of within-organization agreement [63]. The shared views emerged from the bottom-up process then define the social context in which employees adjust their attitudes, perceptions, and loyal uses.

Top-Down Process

Organization-level IQ, SQ, and SOCBs affect employees through a top-down process that describes how contextual factors influence employees' perceptions and evaluations at the individual level, whether through direct or moderating cross-level effects [52]. We use situational strength theory [62] that emphasizes cross-level moderation effects to explain the influence process of organization-level IQ, SQ, and SOCBs. Employees' use of an ERP system reflects their own cost-benefit analysis; but organization-level IQ, SQ, and SOCBs provide a social context that influences the effects of these individual evaluations. As Kozlowski and Klein [52] explain, the relationship between two variables at the individual level may be contingent on a characteristic or condition of the organization in which they are embedded.

According to situational strength theory, a context defines situations that vary in their capacity to restrict the expression of individual differences. This theory highlights the importance of exploring the conditions in which individual differences are more likely to be crucial predictors of behavior (i.e., weak situation) versus those in which such individual effects are likely to be attenuated by situational influences (i.e., strong situation). Typical propositions and hypotheses grounded in this theory focus on the moderating effects and examine whether situations that differ in

strength distinctly influence the magnitude or degree to which individual differences affect behaviors [29].

Situational strength indicates the intensity of an implicit or explicit cue provided by external entities about a focal behavior; it can pressure people to engage in or refrain from the behavior. For example, in a situation marked by strong, prominent contextual cues, people may assign less weight to their individual discretion and assessment and instead rely more on the contextual cues as sources of information to guide behaviors. The effects of individual-level factors on behavior then would be weaker in the presence of high situational strength [76]. If situational strength is low, people likely rely more on their own discretion to steer their behaviors, so that the effects of their idiosyncratic differences become more prominent and influential. In summary, in a strong situation, people sense and recognize clear cues and expectations for their behaviors and therefore tend to act similarly; in a weak situation, they are instead more likely to make behavioral decisions according to their own perceptions and assessments.

Model and Hypotheses

Building on this theoretical foundation, we develop a framework for a multilevel view of loyal use. The framework includes two interactive patterns between employees and the organization, congruent with the interactionist paradigm. Through the lens of social information processing, social learning, and situational strength theories, we describe how individuals' perceived IQ, SQ, and SOCBs emerge at the organizational level through the bottom-up process and exert top-down influences on their loyal use. The rational choice theory [38] argues that people strive to realize optimal utility by taking the best course of action. Accordingly, employees rationally calculate the benefits and costs of different alternatives and choose the one that offers maximal benefits and minimal costs, which bridges their evaluations of an ERP system and loyal use. Figure 1 summarizes the theories that explain the decision process underlying an employee's loyal use.

We use this framework to develop the multilevel model in Figure 2. This model emphasizes the effects of IQ, SQ, and SOCBs at two distinct levels: Employees' rational cost-benefit analysis mediates the effects of individual-level IQ, SQ, and SOCBs; organization-level IQ, SQ, and SOCBs influence the magnitude of the effects of individuals' rational analyses on loyal use, through cross-level moderations. Perceived value helps link system-centric perceptions to loyal use at the individual level; it is composed of a "get" component and a "give" component that determine loyalty [69]. According to Zeithaml [90], product quality is usually a "get" component, and price often constitutes the "give" component. To delineate the motives for employees' discretionary behaviors, beyond mandated uses of an ERP system, we posit that their rational analysis focuses on perceived benefits and workload that denote the benefit (i.e., "get") and cost (i.e., "give"), respectively.

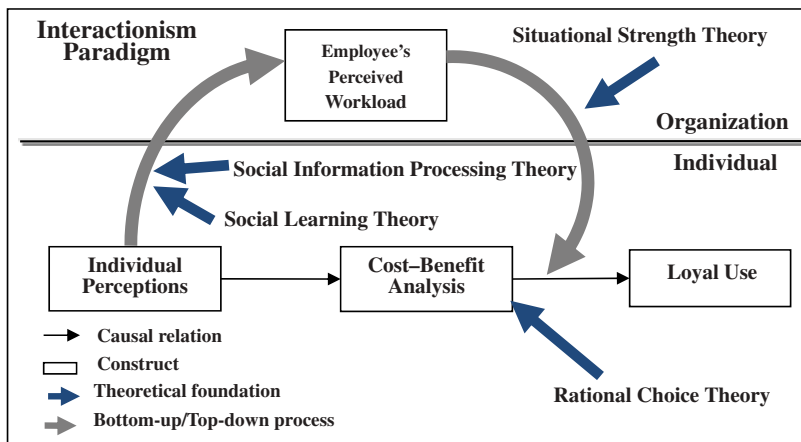


Figure 1. Theoretical Framework

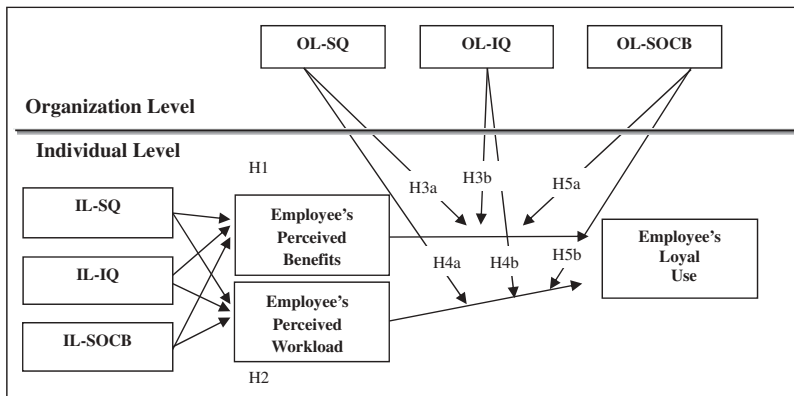


Figure 2. Research Model

Notes: OL-SQ = organization-level system quality; OL-IQ = organization-level information quality; OL-SOCBs = organization-level service-oriented organizational citizenship behaviors; IL-SQ = individual-level system quality; IL-IQ = individual-level information quality; and IL-SOCBs = individual-level service-oriented organizational citizenship behaviors.

Mediating Effects of Individual-Level IQ, SQ, and SOCBs on Loyal Use

Employees often differ in their experiences of using an ERP system, which can affect their perceptions of the system's IQ and SQ. Previous research reveals the importance of perceived SQ and its impacts on user performance and evaluation [70]. Perceived IQ is also associated with perceived usefulness, work quality, decision-making efficiency, and system evaluations [53, 84]. Employees desire high-quality systems to support their task performance [34]; they should lean toward

using an ERP system more extensively when they perceive its IQ and SQ positively [70] and in turn voluntarily spread similar uses throughout the organization.

Furthermore, SOCBs, though not an intrinsic attribute of an ERP system, can influence employees' system assessments and uses as well. The use of an ERP system usually involves unexpected trouble-shooting, periodic updates, and functionality refinements; employees almost inevitably encounter problems with using the system. If they cannot overcome these hurdles easily, employees likely become frustrated, reluctant, or even resistant to exploring more system features or recommending system uses to others. In this vein, the quality of service that employees receive from the internal IS staff matters. All else being equal, employees are more likely to develop loyal use if they perceive SOCBs by the internal IS group.

Perceived IQ and SQ influence system use through the mediating effects of other key factors [53]. Benlian et al. [10] caution against attributing people's use of an IS based only on their evaluations of the system or its information output. Ajzen [3] considers IQ and SQ object-based attitudes and argues that they cannot explain individual intentions or behaviors directly; rather, their effects appear mediated by behavioral beliefs. Several previous studies also report an indirect effect of service quality on behavioral intention, through perceived value [83]. Thus, employees' perceptions of an ERP system's IQ and SQ, as well as of the SOCBs of the internal IS group, should indirectly influence their loyal use, through essential evaluative (cognitive) beliefs.

With a rational choice theory lens, we predict that people choose to expand their use of an IS and willingly recommend such uses to others if they perceive that the benefits significantly exceed the costs. When using an ERP system, employees expect increased task performance, better analysis support, more timely and comprehensive reporting, enhanced decision making, or improved anomaly detection capabilities [78]. Employees' evaluations of such benefits reflect their beliefs about the outcomes of using an ERP system (i.e., its usefulness), as indicated by job performance accuracy, effectiveness, or efficiency [72]. Employees' beliefs about work performance improvement resulting from their use of an ERP system also might escalate if they receive SOCBs of internal IS staff. The theory of reasoned action [39] and theory of planned behavior [3] also suggest a positive relationship between a system's quality and perceived benefits, as well as between perceived benefits and system use [72]. Thus, we hypothesize:

Hypothesis 1: The benefits of using an ERP system, as perceived by employees, mediate the effects of individual-level (A) IQ, (B) SQ, and (C) SOCBs on their loyal use of the system.

An ERP system can support a wide array of business operations and work tasks that differ in their requirements and objectives. Employees follow defined processes, programmed procedures, and standardized workflows to coordinate and complete work tasks, such that they must often perform tedious documentations, deal with slow response time, and overcome system errors or unexpected crashes, all of which can increase their workload considerably [7]. Employees become frustrated when an ERP system is not reliable or plagued with problems that lead to breakdowns or

require reworks [1]. Their workloads can increase substantially if a system is difficult to use or unreliable. If internal IS staff cannot provide effective, timely assistance, employees must expend more time and efforts to deal with the problematic issues and challenges surrounding their use of the ERP system. The resulting increase in their workload could induce perceptions, behaviors, and commitments that discourage loyal use [37]. Thus, we hypothesize:

Hypothesis 2: The workload associated with using an ERP system, as perceived by employees, mediates the effects of individual-level (A) IQ, (B) SQ, and (C) SOCB on their loyal use of the system.

Organization-Level SQ and IQ Moderating Effects of Individual Assessments on Loyal Use

The extent to which a person's rational, cognitive analysis determines his or her loyal use may be contingent on the contextual condition. According to situational strength theory [62], the relationship between employees' perceived benefits of using an ERP system and their loyal use could be influenced by the strength of the situation. In an organization, employees seek to make sense of an ERP system by observing and interacting with coworkers [68]; thus the collective views of the organization's SQ and IQ signify the strength of the situation. A prominent, shared view of the system's SQ provides a clear, compelling cue to employees regarding its reliability, functionalities, and ease of use. Similarly, organization-level IQ signifies and conveys a system's ability to provide accurate, complete, timely, and interpretable information to support work tasks, reporting, and decision making. Positive views of an ERP system's SQ and IQ that prevail in the organization, in combination with mandatory use, constitute a strong situation in which unambiguous expectations foster and positively influence employees' perceptions, assessments, and behaviors. In contrast, vague or unfavorable collective views of SQ and IQ in mandatory scenarios denote a weak situation in which the use of an ill-designed, unreliable system conveys an ambivalent message, without clear or convincing evidence to encourage enthusiastic, extended uses of the system. In summary, employees analyze benefits to determine loyal use; prominent, strong cues prevailing in the organization could attenuate the reliance on their own assessments and perceptions. In a weak situation, employees instead sense the lack of clear cues or behavioral expectations and therefore rely more on their own benefit assessments. Thus, we hypothesize:

Hypothesis 3a: Organization-level SQ moderates the effect of employees' perceived benefits on loyal use; specifically, the effect of their perceived benefits decreases as organization-level SQ increases.

Hypothesis 3b: Organization-level IQ moderates the effect of employees' perceived benefits on loyal use; specifically, the effect of their perceived benefits decreases as organization-level IQ increases.

We expect similar moderations by organization-level SQ and IQ in the relationship between perceived workload and loyal use. A strongly positive, shared view of an ERP system's SQ provides clear and compelling cues that support easy detection and sensemaking by employees. Organizations implement ERP systems to standardize processes and improve operations, though this shift inevitably demands more work from employees. In recognizing shared, positive views of an ERP system's SQ and IQ, employees likely become less sensitive to the perceived workload in choosing whether to engage in loyal use. When the SQ or IQ of a mandated ERP system is not widely recognized by the "collective mind" (i.e., absence of strong situational cues), employees receive weak signals and insufficient cues from the organization and therefore likely rely on their own workload assessments for loyal use. Accordingly, we hypothesize:

Hypothesis 4a: Organization-level SQ moderates the effect of employees' perceived workload on loyal use; specifically, the effect of their perceived workload decreases as organization-level SQ increases.

Hypothesis 4b: Organization-level IQ moderates the effect of employees' perceived workload on loyal use; specifically, the effect of their perceived workload decreases as organization-level IQ increases.

SOCBs Moderating Effects of Individuals' Assessments on Loyal Use

The SOCBs of the internal IS group provide an essential contextual cue and can exert cross-level effects that influence the effects of employees' perceived benefits and workload on loyal use. The presence of high SOCBs indicates a strong situational context; in contrast, low-level SOCBs represents a weak situation. When IS professionals, as a group, engage in SOCBs at a high level, employees can easily recognize and interpret the expected behaviors and benefits. In this vein, the SOCBs of the internal IS group create contextual influences that attenuate the risk of unfavorable behaviors by employees, such as those that stem from their perceptions of increased workloads due to the use of an ERP system. By providing effective services in a proactive and timely manner, internal IS staff also can encourage employees to expand their uses of an ERP system and foster stronger psychological commitments that reduce the variability in loyal use that results from individual cost-benefit evaluations. However, if the internal IS group engages in low SOCBs, employees must solve system problems on their own, and they likely rely more on their own perceptions and evaluations for making loyal use choices. Therefore, we hypothesize:

Hypothesis 5a: The SOCBs of the internal IS staff moderate the effect of employees' perceived benefits on loyal use; specifically, the effect of their perceived benefits decreases as SOCBs increase.

Hypothesis 5b: The SOCBs of the internal IS staff moderate the effect of employees' perceived workload on loyal use; specifically, the effect of their perceived workload decreases as SOCBs increase.

Study Design and Data

Participating organizations and respondents. We targeted large Taiwanese firms that currently used an ERP system implemented at least six months prior to our study, and primarily maintained and serviced the system using their internal IS staff. With the assistance and endorsement of the Taiwanese ERP Society, we identified 242 firms to which we mailed invitation letters to solicit their voluntary participation. After one week, we sent a reminder e-mail message. A total of 57 firms indicated their willingness to participate; 9 of them were excluded from our consideration because they mainly outsourced support of their ERP system to external providers. We removed another firm due to insufficient within-organization agreement. As a result, our sample had 47 firms from which we sought to obtain matched samples of employees and IS professionals.

We conducted a web-based survey of employees and internal IS staff members. To obtain matched samples across firms, we sought comparable numbers of employees and IS staff from each organization. Collecting responses from both employees and IS staff members is advantageous, because it provides dyads in each organization and supports analyses from the perspectives of both service recipients and providers. In particular, we collected responses about the IS staff's SOCBs from both employees and IS professionals, two principal constituencies that form the social context of system use in the organization. Employees, as service recipients, are legitimate respondents to assess SOCBs. Assessments by IS staff members, who often work and interact with one another, reflect their understanding of the services from the provider's aspect. Previous research usually examines OCB from the perspective of the service recipients or a supervisor, but the provider's perspective can be an essential, valid source as well [82]. Obtaining assessments from multiple sources also allows data triangulation, helps reduce the potential for common method bias, and thereby produces results with greater reliability and validity [71].

Measurements. We used items adapted from previously developed and validated scales to measure the investigated constructs. Specifically, we measured perceived benefits with items from Rai et al. [72] and perceived workload with items from Caldwell et al. [23]. We asked employees to assess their ERP system's SQ and IQ, using items from Nelson et al. [65] and McKinney et al. [60], respectively. The internal IS group's SOCBs were measured with items from Bettencourt et al. [13], which we modified according to a referent-shift consensus approach to help the respondents shift the referent of the item description from an individual (i.e., "I") to a more collective assessment (i.e., "IS group") [51]. We used shared perceptions in the organization to operationalize organization-level IQ, SQ, and SOCBs. Because we considered these factors as originating and emerging from individuals'

perceptions and experiences [52], we aggregated employees' evaluated responses in each participating organization (see "Data Aggregation and Analyses" for aggregation details and statistics). Our application of a referent-shift consensus approach on measurement items, which asked respondents to shift the referent of item descriptions from an individual (i.e., "I") to a more collective assessment (i.e., "the ERP system" or "the IS group"), allowed aggregations of employees' assessments to indicate IQ, SQ, and SOCBs at the organizational level. In addition, the items for loyal use, our dependent variable, were adapted from [12, 80].² In Appendix B [found as online supplemental data], we list the items used in our study.

We administered the survey in Chinese. Because the original items were available in English, we performed translation and back-translation to ensure their semantic consistency [17].³ All the items relied on six-point Likert scales, with 1 being "strongly disagree" and 6 being "strongly agree." We adopted an even-number scale, because Asian respondents tend to value modesty and are more likely than Western counterparts to select a scale midpoint [79].

Control variables. We controlled for the employee's gender, age, tenure with the organization, previous experience using an ERP system, and interactions with the internal IS staff. Computer self-efficacy was also included as a control variable, because of its probable effects on employees' perceptions, assessments, and use of the ERP system [84]. This self-efficacy measure [28] appeared in the individual-level analyses, to reduce the spurious effects that may result from model misspecification.

Data collection. We randomly selected 15 employees and 5 IS staff members from each participating organization and e-mailed them an introduction to our study and a hyperlink to a designated, password-protected survey website. Each employee responded to questionnaire items related to perceived benefits, perceived workload, IQ, SQ, SOCBs, control variables, and loyal use (39 items total). Each IS staff member answered items pertaining to the group's SOCBs (13 items total). We grouped the responses by organization to create a matched sample for the paired dyadic analyses across different organizations. Each respondent had two weeks to complete the survey online; we sent a follow-up e-mail to respondents and offered them two more weeks to complete the survey. The extended response window allowed a comparative analysis of early and late respondents for nonresponse bias assessment.⁴ All participation was voluntary and confidential.

Analyses and Results

Among the randomly sampled subjects, 495 IS employees and 170 IS professionals completed the survey. We removed participants from one organization that lacked the necessary within-organization agreement in their responses, as noted previously. Thus the final sample consisted of 485 employees and 166 IS staff members, showing effective response rates of 68.8 percent and 70.6 percent, respectively. We had responses from at least 10 employees and 3 IS professionals from each

participating organization. Among the responding employees, 65 percent were women, the average age was 30.5 years, and the average tenure with the current organization was 3.5 years; 54 percent of the employees had used the ERP system for more than two years, and 34 percent of them frequently interacted with the internal IS staff to facilitate their work. Among the IS professionals, 68 percent were men, their average age was 30 years, and their average tenure with the current organization was 3.3 years. Appendix C [online supplemental data] provides a summary of important demographics of our respondents.

Table 1 contains important descriptive statistics and a correlation matrix of the factors at the individual and organizational levels. The largest significant correlation between predictive variables reached .62. Bryman and Cramer [20] suggest that a relationship must reach at least .8 to indicate multicollinearity; all our correlation values were below this threshold. The variance inflation factors (VIF) for the predictive variables were also far below the common threshold of 10 [42], providing additional evidence that multicollinearity was not a serious problem. The correlation matrix showed that loyal use was significantly associated with individual-level IQ ($r = .65$), SQ ($r = .66$), and SOCBs ($r = .39$). These correlation values are mostly congruent with previous research that reports the correlations of IS quality measures and usage intentions between .53 and .70 [26].

Measurement Validation

To validate our measurements, we performed a confirmatory factor analysis with AMOS 5.0 [5].⁵ After removing five items with low construct loadings (i.e., less than .7), the measurement model showed good fit to the data. We assessed convergent validity in terms of the factor loadings of the measurement items and the estimated average variance extracted (AVE) for each construct. The standardized factor loadings of the items that measured the respective construct (factor) were greater than .7, a common threshold that signifies satisfactory convergent validity [4]. The estimated AVE of all the investigated constructs, ranging between .53 and .85, also exceeded the common cutoff of .5 [6], in support of adequate convergent validity. We examined discriminant validity by comparing the square root of the AVE of each construct with the relation between the reflective construct pairs. As the diagonal elements of the matrix in Table 1 reveal, the square root values of AVE for the respective constructs were all higher than any correlations with other constructs, thus suggesting satisfactory discriminant validity [40]. Regarding reliability, the composite reliabilities, ranging between .77 and .96, all exceeded the common .6 threshold [6]. Overall, the unidimensional measures appeared reliable and valid for each construct.

Data Aggregation and Analyses

To obtain organization-level IQ and SQ and the SOCBs of the IS group, we aggregated individual responses to estimate the respective scores for each

Table 1. Descriptive Statistics for the Investigated Constructs

Variable	Mean	SD	VIF	IQ	SQ	SOCBs	PB	PW	CSE	LU
Individual-level (N = 485)										
(1) Information quality (IQ)	4.55	0.78	1.95	0.74						
(2) System quality (SQ)	4.20	0.82	1.90	0.58**	0.73					
(3) Service-oriented citizenship behaviors (SOCBs)	4.68	0.52	1.40	0.44**	0.46**	0.84				
(4) Perceived benefits (PB)	4.12	0.90	1.82	0.62**	0.54**	0.40**	0.87			
(5) Perceived workload (PW)	3.19	0.97	1.10	-0.06	-0.26**	-0.09*	-0.02	0.86		
(6) Computer self-efficacy (CSE)	4.07	0.85	1.07	0.19**	0.14**	0.23**	0.11*	-0.01	0.87	
(7) Loyal use (LU)	4.50	0.91	DV	0.65**	0.66**	0.39**	0.71**	-0.23**	0.18**	0.92
Organization-level (N = 47)										
(1) Information quality (IQ)	4.54	0.38	1.74	—						
(2) System quality (SQ)	4.20	0.41	1.81	0.64**	—					
(3) Service-oriented citizenship behaviors (SOCBs)	4.68	0.52	1.28	0.40**	0.44**	—				

* $p < .05$. ** $p < .01$.
Notes: Boldface diagonal values are the square roots of the average variance extracted. SD = standard deviation; VIF = variance inflation factor.

participating organization [52]. Specifically, we computed the score of the aggregate-level SOCBs in each organization by averaging the sum of the responses from employees and those from IS professionals. We then used this score in the subsequent analyses, similar to organization-level SQ and IQ.

To ensure that we could create macro-level constructs through aggregation, we computed the within-organization agreement index (r_{wg}) and intraclass correlations (ICCs) [15, 51]. In general, the r_{wg} value indicates the degree to which the responses to a measurement scale by members of the same organization converge [51]. The ICC_1 compares between-organization variance against within-organization variance, to reveal the portion of variance in individual responses accounted for by the between-organization difference; ICC_2 instead indicates the reliability of the organization-level means [15]. We obtained average r_{wg} values of .94 for IQ, .86 for SQ, and .94 for SOCBs. From our analysis of the between-organization variance and organization-level mean reliability, we obtained the following results: $ICC_1 = .14$ and $ICC_2 = .63$ ($F = 2.70, p < .001$) for IQ; $ICC_1 = .16$ and $ICC_2 = .66$ ($F = 2.97, p < .001$) for SQ; and $ICC_1 = .28$ and $ICC_2 = .58$ ($F = 2.37, p < .001$) for SOCBs. Most of the intraclass coefficients exceeded their respective thresholds: .70 for r_{wg} [51], .12 for ICC_1 , and .60 for ICC_2 [15]. Although SOCBs had an ICC_2 value of .58, slightly lower than .60, we considered it acceptable, mainly because the underlying aggregation can be justified theoretically by OCB theories, and the average r_{wg} was sufficiently high [56].

We used hierarchical linear modeling (HLM) to test the hypotheses at the individual level and between levels. In general, HLM allows for simultaneous tests of the effects of variables at multiple levels on individual-level outcomes, while maintaining appropriate analyses of the respective predictors. Conventional regression-based analysis methods are not appropriate for data with a multilevel structure [19], because they estimate key parameters with a linear model at one level but do not consider variations across sampled groups, and thus often produce incorrect results or estimations. Previous studies thus adopt HLM because of its ability to produce tractable, efficient estimations of the underlying multilevel effects [25].

Before testing our hypotheses, we estimated a null model to determine whether any significant between-organization variance existed in loyal use [19]. The absence of such significant between-organization variances in loyal use would nullify the need to use HLM, because the relationships of the investigated variances would not differ across organizations. Our variance partitioning analysis showed that between-organization differences accounted for approximately 12.70 percent of the total variance in loyal use; that is, $.0281 / (.0281 + .1932)$. The chi-square test also showed significant between-organization variance: $\gamma_{00} = .0281, \chi^2 = 114.201, df = 46, p < .001$. These results supported the use of HLM to test our hypotheses. In our HLM analyses, we group-mean centered Level-1 predictors, a rescaling practice capable of mitigating potential multicollinearity threats that are normally associated with higher-level intercept and slope estimates and thereby providing better interpretations of the cross-level interaction effect [44].

Hypotheses Test Results

We followed Baron and Kenny's procedure [9] to test H1 and H2 that target mediations at the individual level; that is, perceived benefits and perceived workload mediating the effects of individual-level IQ, SQ, and SOCBs on loyal use. In Table 2, we summarize the individual-level analysis results. As shown, individual-level SQ and IQ were significantly associated with loyal use, after controlling for computer self-efficacy, gender, age, tenure with current organization, previous experience with ERP system, and interactions with IS staff. The relationship between individual-level SOCBs and loyal use was not statistically significant. These results, as Model 3 in Table 2 indicates, satisfied the requirement for testing mediation effects for individual-level SQ and IQ but not for SOCBs. We next examined whether individual-level SQ, IQ, and SOCBs were significantly associated with perceived benefits and workload, as mediators. As the results for Models 1 and 2 revealed, individual-level SQ was significantly associated with perceived benefits ($\gamma = .32, p < .001$) and perceived workload ($\gamma = -.29, p < .001$). Individual-level IQ and SOCBs were significantly associated with perceived benefits ($\gamma_{IQ} = .47, p < .001$; $\gamma_{SOCBs} = .11, p < .05$) but not with perceived workload, so we could not further examine the mediation of perceived workload in the relationships of IQ or SOCBs with loyal use. We included individual-level SQ, IQ, SOCBs, and the mediators in Model 4; perceived benefits and perceived workload remained significantly associated with loyal use. The effects of individual-level IQ and SQ on loyal use also remained significant when we added the mediators to the model. Compared with what we observed in Model 3, the effect magnitude of IQ and SQ decreased noticeably. Our results thus suggested that perceived benefits partially mediated the effects of both individual-level IQ and SQ on loyal use and that perceived workload partially mediated the effect of individual-level SQ. We observed no significant mediation effect in the relationship between individual-level SOCBs and loyal use. Thus, our data supported H1a and H1b but not H1c; similarly, they supported H2b but not H2a or H2c. The Sobel [81] test results confirmed the significance of the partial mediation effects: The chain from SQ to perceived benefits to loyal use produced $z = 5.57, p < .001$; the values from SQ to perceived workload to loyal use were $z = 3.95, p < .01$; and the result from IQ to perceived benefits to loyal use was $z = 7.26, p < .001$.

H3–H5 involve cross-level moderation effects. We constructed a level-2 (aggregate) model to examine the effects of organization-level IQ, SQ, and SOCBs in the relationship between employees' cost–benefit analysis and their loyal use (see Appendix D as online supplemental data for the equations of level-1 and level-2 models). Our analysis used the intercepts and slopes from the individual-level analysis as dependent variables, which we predicted with organization-level variables [19]. Specifically, we first determined the model's explanatory power, as manifested with the pseudo R^2 (see Table 3), by calculating the total variance explained as: Pseudo $R^2 = R^2_{within-organization} \times (1 - ICC_1) + R^2_{between-organization} \times ICC_1$ [19]. According to our results, Model 2 explained 57 percent of the total

Table 2. Testing the Mediation Effects of Perceived Benefits and Perceived Workload

Individual-level predictors	Dependent variable			
	Perceived benefits		Perceived workload	
	Model 1	Model 2	Model 3	Model 4
Intercept	4.11***	3.18***	2.34***	2.33***
Computer self-efficacy ^a			0.03	0.04*
Gender ^a			0.03	0.01
Age ^a			0.01	0.01
Tenure with current organization ^a			-0.02	-0.01
Prior experience with ERP system ^a			0.02	0.02
Interactions with internal IS staff ^a			0.01	-0.01
Individual perceived SQ	0.32***	-0.29***	0.23***	0.15***
Individual perceived IQ	0.47***	0.09	0.22***	0.13***
Individual perceived SOCBs	0.11*	0.04	0.01	-0.02
Perceived benefits (PB)				0.23***
Perceived workload (PW)				-0.07***
Pseudo R^2	0.24	0.02	0.24	0.26
Model deviance	1,020.08	1,324.85	370.30	265.08

^a Control variable. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3. Hierarchical Linear Model Test of Cross-Level Moderation Effects

	Dependent variable: Loyal use		
	Null model	Model 1	Model 2
Level-1 model			
Intercept	2.34***	2.33***	2.34***
Computer self-efficacy ^a		0.05**	0.04*
Gender ^a		0.01	0.02
Age ^a		0.01	0.01
Tenure with current organization ^a		-0.01	-0.01
Prior experience with ERP system ^a		0.03*	0.03*
Interactions with IS staff ^a		-0.01	-0.01
Perceived benefits (PB)		0.35***	0.34***
Perceived workload (PW)		-0.09***	-0.09***
Level-2 model			
System quality (OL-SQ)			0.29***
Information quality (OL-IQ)			0.24**
Service-oriented citizenship behaviors (OL-SOCBs)			-0.02
Cross-level interactions			
PB × OL-SQ			-0.11*
PB × OL-IQ			0.01
PB × OL-SOCB			-0.12*
PW × OL-SQ			-0.01
PW × OL-IQ			0.14*
PW × OL-SOCB			-0.09
Between-organization variance		0.38	0.80
χ^2		241.82	72.51
<i>p</i> -value		< .001	< .01
Pseudo <i>R</i> ²		0.26	0.57
Model deviance	625.86	339.37	286.86

^a Control variable. **p* < .05. ***p* < .01. ****p* < .001.

Note: OL = organization-level.

variance in loyal use. We also examined the model deviance statistics (i.e., $-2 \times \log$ -likelihood of a maximum-likelihood estimate), as a measure of model fit [19], to determine whether the inclusion of additional predictors actually improved the model. Smaller model deviance indicates better fit. We observed a substantial decrease in model deviance from Model 1 to Model 2 (Δ deviance = 52.51, $df = 9$, $p < .05$); that is, including organization-level predictors and cross-level interactions offered a better explanation of loyal use.⁶

The results of Model 2 in Table 3 show an insignificant cross-level interaction between organization-level IQ and perceived benefits. Thus, our data did not support H3b. Instead, we observed a significant interaction effect between organization-level SQ and perceived benefits ($\gamma = -.11$, $p < .05$), suggesting that the relationship of perceived benefits and loyal use was conditional on the organization-level SQ. To

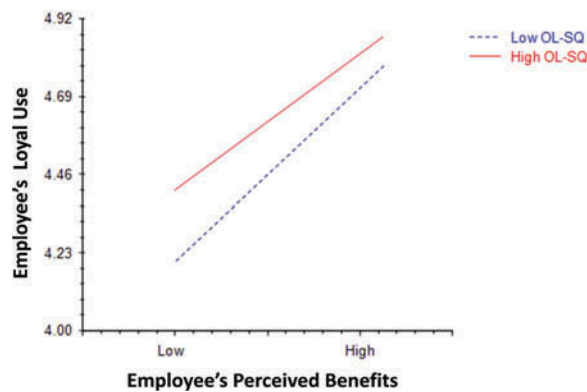


Figure 3. Moderation of Organization-Level SQ in Perceived Benefits–Loyal Use Relationship

explore this cross-level interaction further, we plotted the relationship of perceived benefits and loyal use for high and low organization-level SQ, represented by values above the 75th percentile and below the 25th percentile, respectively [2]. As the plot in Figure 3 shows, the slope for the low group was steeper, in line with situational strength theory. That is, a tendency to increase loyal use with higher perceived benefits was more apparent in the weak, compared with the strong, situation. Thus, our data supported H3a.

The results of Model 2 in Table 3 show that organizational-level IQ significantly moderated the effect of perceived workload on loyal use ($\gamma = .14, p < .5$); however, the cross-level interaction of organizational-level SQ and perceived workload was insignificant statistically. Therefore, our data supported H4b but not H4a. Following the same procedure, we scrutinized H4b by plotting loyal use associated with high versus low organization-level IQ (see Figure 4). We notice that the trends of decreased loyal use along with an increased perceived workload were more apparent in the low than in the high organization-level IQ condition.

Our data partially supported the cross-level moderation effects of SOCBs. Only the cross-level interaction between organization-level SOCBs and perceived benefits was statistically significant ($\gamma = -.12, p < .05$). As we show in Figure 5, the level of organization-level SOCBs diminished the effect of perceived benefits on loyal use, in support of H5a. We observe no significant moderation effects of organizational-level SOCBs in the relationship between perceived workload and loyal use ($\gamma = -.09, p > .05$), so our data did not support H5b.

Finally, we analyzed the nonsignificant results by scrutinizing the potential for sampling bias. We examined the robustness of the results of our HLM analysis by randomly selecting two organizations and excluding them from the analysis (Model 2, Table 3). Highly similar results emerged for both the estimates and patterns, suggesting the robustness of our results. We summarize our hypothesis testing results in Figure 6.

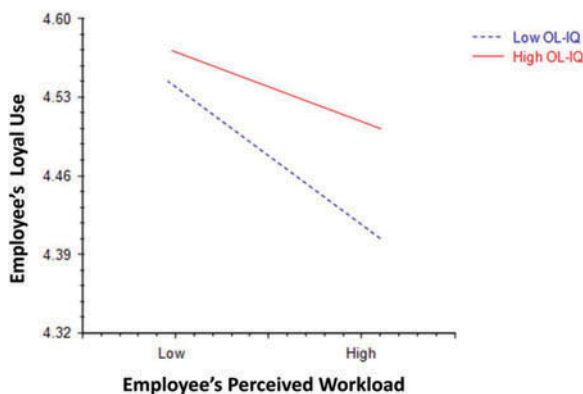


Figure 4. Moderation of Organization-Level IQ in Perceived Workload–Loyal Use Relationship

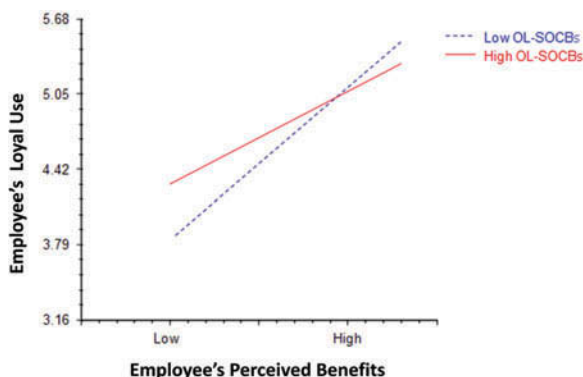


Figure 5. Moderation of Aggregate-Level SOCBs in Perceived Benefits–Loyal Use Relationship

Discussion

Our results have several implications for research. First, IQ, SQ, and SOCBs at the organizational level influence employees' loyal use of an ERP system in ways different from their effects at the individual level. Our findings underscore the significance of social influence process by suggesting that employees consider shared prevalent SQ and IQ in the organization as essential social references for determining their loyal use of a mandatory ERP system. This study demonstrates the

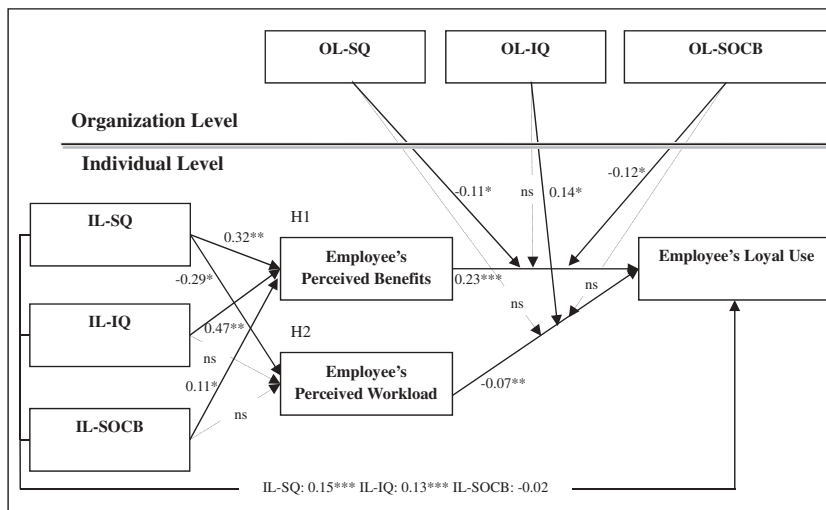


Figure 6. Summary of Hypothesis Testing Results

Notes: OL-SQ = organization-level system quality; OL-IQ = organization-level information quality; OL-SOCBs = organization-level service-oriented organizational citizenship behaviors; IL-SQ = individual-level system quality; IL-IQ = individual-level information quality; and IL-SOCBs = individual-level service-oriented organizational citizenship behaviors.

value and feasibility of a multilevel approach that distinguishes IQ, SQ, and SOCBs at individual and organizational levels, which jointly provide a fuller explanation of employees' loyal use of an ERP system in the organization. The observed moderating effects of organization-level IQ, SQ, and SOCBs reflect situational strength theory. Toward that end, Meyer et al. [61] identify essential facets to operationalize situational strength—clarity, consistency, constraints, and consequences—which together provide a basis for explicating how situation strength influences individual behaviors. Accordingly, we consider organization-level IQ, SQ, and SOCBs for defining situational strength, because they reveal the extent to which employees receive clear signals and consistent cues regarding their use of an ERP system, as well as the constraints and consequences of their system uses.

Second, IQ and SQ at the individual level affect employees' loyal use through the mediation of perceived benefits and perceived workload. Our results augment previous research [72] by revealing a utilitarian orientation grounded in individual, cognitive cost–benefit assessments of system use. This orientation could bridge perceived system qualities, utilities, and loyal use in mandatory use settings. Although several previous studies report the potential mediation of usefulness in the effects of perceived IQ and SQ on intention to use [89], the role of perceived workload has been mostly overlooked. As Zeithaml [90] notes, perceived value is a trade-off between “giving” and “getting.” In this light, individual perceptions of the benefits and costs associated with a mandatory ERP system should be considered

simultaneously, because together they could mediate the effects of perceived IQ and SQ on loyal use.

Third, SOCBs are essential, service-oriented factors that can influence individual assessments and behaviors, including loyal use of an ERP system. Compared with SQ and IQ, service quality has received much less research attention [70]; few studies examine the effects of perceived SQ, IQ, and service quality simultaneously [26]. We emphasize the services by internal IS staff and examine how these collective service behaviors produce effects at the individual and organizational levels. Research that considers the effects of a system's IQ and SQ simultaneously can better explain people's system use behaviors by including the SOCBs of the internal IS staff, which can enhance employees' perceived benefits and reduce their dependence on their personal beliefs when determining their loyal use of an ERP system. Previous studies have shown the significance of OCB in ordinary consumer service contexts [75]; our study suggests similar importance but a different influence process in an internal service setting.

Some of the findings, which are not congruent with our predictions, also deserve further analysis. For example, perceived workload does not seem to mediate the effect of individual-level IQ on loyal use. Perhaps the predicted mediation effect is contingent on other factors, such as experience with similar systems or usage frequency. According to an ex post analysis, the expected negative relationship between individual-level IQ and perceived workload is statistically significant for employees with less experience (≤ 2 years) with the ERP system ($r = -.125, p = .06$). Thus, an ERP system's IQ might reduce workloads, especially for employees who have limited experience with the system. Over time, employees gain experience and skills, such that they need less effort to process the output of the ERP system. Further research should examine this mediating relationship more closely and consider other key factors with potential contingent effects.

Neither perceived benefits nor perceived workload mediated the relationship between SOCBs and loyal use; SOCBs also had no significant, direct effects on loyal use. Despite the suggestion of a direct relationship between service quality and customer loyalty [91], no studies have confirmed a direct effect of service quality, delivered by internal IS professionals, on employees' use of an IS. We show that the SOCBs of IS staff influence loyal use but seemingly only through perceived benefits. The lack of a direct relationship may suggest that receiving extraordinary support from IS staff is not sufficient to motivate employees to engage in extended use of or enthusiastically advocate the system, but the IS staff can encourage employees' loyal use by helping them gain more benefits from using the system. The insignificant relationship between SOCBs and workload suggests a minor role of the internal IS staff's SOCBs in relieving employees' workload, which could occur because such behaviors are beyond employees' expectations of IS professionals' job responsibility. Instead, they might incline to associate their increased workload with other factors related to the vendor, the system, or administrative procedures.

Also in contrast to our prediction, organization-level IQ did not mitigate the effect of perceived benefits on loyal use. Although positive, organization-level IQ

signals that other users of the ERP system perceive its usefulness, the value of the information output to an employee's job still depends on his or her specific working conditions, such as the fit between the provided information and particular job tasks. Thus, organization-level IQ may not establish a contextual condition strong enough to alleviate the dominant influences of individual perceived benefits on loyal use. Furthermore, the insignificant cross-level moderation of organization-level SQ and SOCBs in the relationship between perceived workload and loyal use reveals the limited utility of technical assistance in work contexts as a means to mitigate the impact of perceived workload on loyal use. The downside of using the ERP system in a postimplementation stage might not arise due to system functionalities or features; instead, frequent changes or updates to the ERP system, triggered by new organization processes, enhancements, or patches after the implementation stage, could cause seemingly resolved problems to resurface.

Our results also offer several implications for practice. For example, employees anchor their loyal use of a mandatory system on their perceptions of the system's qualities and their cognitive analysis of the associated benefits and costs. This utility-versus-workload trade-off offers a mechanism to link the perceived qualities of a system with loyal use and emphasizes the importance of designing ERP systems that match both job tasks and performance requirements. Managers can mandate system use, but employees always have some discretion in the breadth and depth of their system usage. To harness the full benefits of an ERP system, managers have to demonstrate and convey the system's utilities and devise means to reduce the associated workload. Although loyal use relies on employees' cognitive assessments of an ERP system, such effects might be mitigated by essential forces that emerge at the organizational (contextual) level. Managers thus need to find ways to create positive, salient, shared views, including SOCBs by the internal IS group, to propel loyal use among employees, as well as reduce employees' reliance on their own cognitive assessments. For example, organizations should mindfully seed change agents and opinion leaders in each work group or functional department, whose views and behaviors might induce favorable shared views throughout the organization. The SOCBs of the internal IS group also are crucial and can encourage and foster employees' loyal uses of an ERP system. Managers therefore should encourage SOCBs by devising informal influence mechanisms. It is difficult to specify all the role-specific behaviors and services required of IS personnel, so leadership by senior management and the aligned voluntary support of IS managers are important for creating mechanisms, processes, and conditions that prime, solidify, and foster favorable, appropriate SOCBs [27].

Conclusion

Our study makes several research contributions. First, we examine employees' loyal use of a mandatory ERP system, a critical challenge facing many organizations that

has received little attention in previous research. Second, we take a multilevel approach to analyze loyal use, premised in interactional psychology theories in general and situational strength theory in particular. With this approach, we investigate individual cognitive assessments of an ERP system at the individual level, their aggregation as influences at the organizational level, and the interactions between these two levels. Our approach is also methodologically advantageous; we collected the responses of employees and IS staff members from each participating organization and used them to create dyads that could be analyzed by HLM, which offers greater interpretability than do regression-based analysis methods. Third, we consider the SOCBs of internal IS groups, which have been overlooked by previous IS research. Fourth, our results shed light on important antecedents and underlying influence processes that lead to employees' loyal use of a mandatory ERP system in an organization.

This study represents a point of departure for examining employees' loyal use of a mandatory IS and highlights several areas for further attention. For example, we used cross-sectional data, collected from individual self-reports in a web-based survey. Research that examines loyal use in different organizational contexts (e.g., nonprofit organizations, government agencies) and targets other enterprise systems, using longitudinal data from multiple sources, can produce more generalizable, robust results. Our conceptualization and operationalization of loyal use focus on extended use and recommendation, which may not totally capture employees' loyal use of an IS in mandatory use contexts. Future research should consider additional aspects, such as switching behaviors, to better conceptualize and operationalize loyal use. We conceptualize organization-level IQ and SQ as shared perceptions, aggregated from individual responses. Additional research should further consider collective-level IQ and SQ in terms of the consensus among individuals in the organization. Finally, our analysis of loyal use is grounded in interactional psychology and situational strength theory, which suggest several essential influences on loyal use. Important factors that define situation strength and the mechanisms that create its influences on loyal use matter and deserve consideration in future studies. For example, we do not directly analyze the different facets of situational strength (i.e., clarity, consistency, constraints, and consequences) or examine their respective effects; future research should elucidate their roles, individual and in combination, in defining situational strength.

Supplemental File

Supplemental data for this article can be accessed on the publisher's website at <http://dx.doi.org/10.1080/07421222.2015.1138373>

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NOTES

1. Acknowledging the subtle differences among continuance of use, continued use, and postadoption use, we consider these usage behaviors mostly interchangeable, rather than attempting to differentiate them explicitly.

2. The original items focus on two indicators of loyal customers: repurchase and recommendation. To fit our study context, we adapted one item to measure an employee's use of more system features and functionalities in many work tasks, which mimics a consumer's behavior of purchasing more from a store [80]. The psychological commitment item refers to an employee's willingness to recommend such system uses to others in the organization. Our use of a single item to measure each respective subdimension of loyal use is in line with Bergkvist and Rossiter [11], who suggest that single-item measures are sufficient if, in the minds of respondents, the object of the construct is concrete and singular, and the attribute of the construct is concrete (i.e., easily and uniformly imagined). Previous research, including [77], similarly employs single items to measure the different subdimensions of a formative construct.

3. An experienced IS researcher, fluent in both English and Chinese, translated the original question items to Chinese. Another IS researcher, also fluent in both languages, translated these items back to English. A panel of three experienced IS researchers and five senior IS managers, knowledgeable about ERP systems, assessed each back-translated item to ensure that the semantics of the original item had been preserved.

4. We assessed nonresponse bias by comparing respondents who completed the survey in the initial response window with those who needed additional time to do so. Chi-square tests and Student's *t*-tests indicated no significant between-group differences in gender, age, tenure with the organization, previous experience using the ERP system, or interactions with internal IS staff (largest $\chi^2 = 2.24$; $p > .10$). The between-group differences in the mean of each item were not significant either (largest $t = .18$; $p > .10$). We followed the same procedure to assess nonresponse bias in the IS staff members' assessments and noted no significant differences between early and late respondents (largest $\chi^2 = .96$; $p > .10$; largest $t = 1.65$; $p > .10$). Thus, nonresponse bias did not seem to pose a serious threat.

5. Because loyal use is operationalized as a formative construct, we first performed partial least squares structural equation modeling to estimate the value of loyal use. We used bootstrapping with 200 resamples to test the significance of the respective path coefficients. The weights for the two items measuring loyal use (LU) were .601 and .437. We therefore modeled loyal use as $(.601 \times \text{LU-1} + .437 \times \text{LU-2})$ in all subsequent analyses.

6. Following Hox [45], we analyzed the effect size of the individual-level model (Model 4 of Table 2) and the cross-level full model (Model 2 of Table 3), respectively. For the individual-level model's effect size, we calculated the portion of variance (r^2) in loyal use explained by the model in relation to the within-group variance of the null model. Using the formula, $(\sigma_{\text{null}}^2 - \sigma_{\text{random}}^2) / \sigma_{\text{null}}^2$, we obtained a value of .61; that is $(.193 - .075) / .193 = .61$. We also analyzed the effect size of the full model by calculating the portion of variance (r^2) in loyal use explained by the full model in relation to the between-group variance of the null model. By applying the formula, $(\tau_{\text{null}}^2 - \tau_{\text{slope}}^2) / \tau_{\text{null}}^2$, we noted that the effect size of the full model was .79; that is, $(.028 - .006) / .028 = .79$. Regarding the power of testing Model 4 in Table 2 and Model 2 in Table 3, our results showed that both values exceeded .90, with a sample size of 485. Together, these results suggest acceptable validity of the individual-level model (Model 4 in Table 2) and the full model (Model 2 in Table 3).

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