Communications of the Association for Information Systems

Volume 41 Article 27

12-2017

An Experimental Investigation of the Individual and Joint Effects of Financial and Non-financial Incentives on Knowledge Sharing Using Enterprise Social Media

Degan Kettles
Brigham Young University, degank@gmail.com

Robert D. St. Louis
Arizona State University

Paul John Steinbart
Arizona State University

Recommended Citation
Kettles, Degan; St. Louis, Robert D.; and Steinbart, Paul John (2017) "An Experimental Investigation of the Individual and Joint Effects of Financial and Non-financial Incentives on Knowledge Sharing Using Enterprise Social Media," *Communications of the Association for Information Systems*: Vol. 41 , Article 27.
DOI: 10.17705/1CAIS.04127
Available at: http://aisel.aisnet.org/cais/vol41/iss1/27

Communications of the Association for Information Systems

Research Paper ISSN: 1529-3181

An Experimental Investigation of the Individual and Joint Effects of Financial and Non-financial Incentives on Knowledge Sharing Using Enterprise Social Media

Degan Kettles
Brigham Young University
Information Systems
degank@gmail.com

Robert D. St. Louis
Arizona State University
Information Systems

Paul John Steinbart
Arizona State University
Information Systems

Abstract:

Many organizations implement enterprise social media (ESM) in an effort to capture and store valuable knowledge that employees possess. Unfortunately, more often than not, employees do not make a large number of knowledge contributions. Using agency theory and contingency theory as foundations, we examine managerial interventions that can improve knowledge contribution rates in ESM. Specifically, we investigate the individual and joint effects of paying people to share knowledge, providing social cues, and having supporting and policing moderators on knowledge sharing. We further examine how two contingency factors—the nature of an employee's compensation scheme (variable or fixed) for their primary work task and the employee's belief about the importance of sharing knowledge—affect the relative efficacy of the aforementioned managerial interventions. Although we found evidence that being paid to share knowledge and believing that knowledge sharing is inherently important both increase the amount of knowledge shared, our most important results concern the existence of significant interaction effects. For persons who receive a fixed salary, we found a surprisingly large, positive synergistic effect between being paid to share knowledge and believing that knowledge sharing is important. However, introducing a policing moderator almost completely nullified this synergistic effect. We discuss the implications of these findings for both practice and research.

Keywords: Enterprise Social Media, Knowledge Sharing, Knowledge-management Systems, Experiments, Agency Theory, Self Determination Theory, Crowding effect, Controls.

This manuscript underwent editorial review. It was received 02/10/2016 and was with the authors for 13 months for 2 revisions. K.D. Joshi served as Associate Editor.

DOI: 10.17705/1CAIS.04127

1 Introduction

The phenomenal success of public social media, such as FaceBook, YouTube, Instagram, and Twitter, indicates that people are willing to share vast amounts of information with one another in non-work settings. Therefore, organizations have unsurprisingly attempted to use social media technologies (e.g., wikis, forums, document sharing, and user profiles) included in products such as Jive, Yammer, and Chatter to create private social platforms, which we refer to as enterprise social media (ESM), to support internal knowledge sharing (Cone, 2007; Marsan, 2011). However, although researchers have called social media technologies the "new hope" of knowledge management (Pawlowski et al., 2014), ESM have generally failed to meet expectations (Alali & Salim, 2011; Bush & Tiwana, 2005; Chai & Nebus, 2012; Milton, 2014). Instead, industry leaders now report the prevalence of "zombie" networks that look alive and well but are not actually being used (Denyer, Parry, & Flowers, 2011; Mann, Austin, Drakos, Rozwell, & Walls, 2012; Raths, 2015; Wagner, Vollmar, & Wagner, 2014). Our own discussions with ESM community managers at several large companies[1] indicate that these tools are less successful than expected at increasing knowledge sharing in work settings—particularly among employees such as sales people who have a variable rather than fixed compensation scheme.

One possible explanation for why ESM deployments have failed to meet expectations concerns the inherent conflict that exists between principals and agents. Agency theory posits that, when one party delegates work to another, conflicts in goals frequently exist, and optimal control mechanisms must be developed to resolve the conflicts (Eisenhardt, 1989). Managers who act as principals deploy ESM with the intention that employees will share their knowledge freely so that the organization may reap the benefits of knowledge sharing. But employees already have mandatory, primary tasks to complete on a daily basis that historically have not involved or required ESM usage, and so they are likely to view using ESM as a voluntary, secondary task. This situation suggests an important misalignment in goals, which optimal structuring of incentives may resolve. In this study, we examine the research question:

> **RQ**: When other work tasks take precedence, what incentives are needed to support knowledge sharing in ESM?

To investigate our research question, we conducted a controlled experiment to isolate key factors that are likely to have an impact on knowledge sharing in ESM.

This paper proceeds as follows: in Section 2, we review prior literature on motivation and knowledge sharing using agency theory as an organizing framework and contingency theory and self-determination theory to provide additional insights in that framework. Further, we develop our research hypotheses. In Section 3, we describe the research method we used to test the hypotheses. In Section 4, we present our results and, in Section 5, discuss their theoretical and practical implications. In Section 6, we conclude the paper.

2 Research Model and Hypotheses

Prior research on knowledge sharing using ESM suggests that the effectiveness of specific incentives varies across different contexts. For example, in the context of non-work social media (e.g., Facebook, Twitter), research has found that usage is associated with social factors such as having a sense of belonging, strong social ties, a desire to socialize, personal validation, and so on (Chai & Kim, 2012; Lampe, Ellison, & Steinfield, 2006; Ma & Agarwal, 2007; Subrahmanyam, Reich, Waechter, & Espinoza, 2008). Consequently, it is easy to assume that the social features that facilitate interaction in non-work social media also would drive knowledge sharing in ESM. However, Ellison, Gibbs, and Weber (2015) note that ESM differs from non-work social media on dimensions that include design, audience, and goals for use. For example, Facebook affords socialization as an end unto itself, and typical users seek intrinsic satisfaction through social interaction. In contrast, an ESM platform commonly facilitates networking among colleagues on work topics and discussion and fact finding about specific work tasks. A typical ESM user in a work setting seeks to complete work tasks that require the knowledge or help of others. Since potential ESM users are focused on completing tasks, social features in ESM platforms may only weakly motivate employees to use them and share knowledge unless accompanied by other managerial control mechanisms that explicitly signal the need to also focus on knowledge sharing. Indeed, studies of ESM at

[1] Private discussions between the first author and social community managers at Wells Fargo and Deloitte.

IBM (see DiMicco et al., 2008; DiMicco, Geyer, Millen, Dugan, & Brownholtz, 2009) indicate that the presence of social features (e.g., recognition and feedback from peers) drives usage, but research on the value of social features in other organizations has found mixed results (Chin, Evans, & Choo, 2015; Mettler & Winter, 2015). Perhaps social features made ESM work at IBM because of *other* factors that were also present and, therefore, that a contingency theory perspective is necessary as Huber (2001) suggests.

Another factor that researchers have examined in the context of ESM success is providing financial rewards for knowledge sharing. In work settings, financial incentives are very salient influences: they represent a leading reason why employees perform prescribed tasks or fulfill assigned responsibilities (Bene & Twefik, 2001; DeHoratius & Raman, 2007; Holmstrom & Milgrom, 1991). Thus, it is not surprising that many studies on the topic of knowledge management have looked at payment as a way to increase sharing in knowledge-management systems. This research has found mixed results: some has found a positive relationship, others a negative relationship, and still others none at all (Bock, Zmud, Kim, & Lee, 2005; Cabrera, Collins, & Salgado, 2006; He & Wei, 2009; Kankanhalli, Tan, & Wei, 2005; Lin, 2007; Liu, Liang, Rajagopalan, & Sambamurthy, 2011; Mettler & Winter, 2015; Vuori & Okkonen, 2012). These differences in outcomes suggest that contextual differences in the studies affected the findings.

One contextual difference that the aforementioned studies neglected is the impact that payment for the primary job has on knowledge sharing. Studies have typically treated knowledge sharing in systems as a secondary task or responsibility supported by incremental payments such as bonuses, but they have not accounted for the presence of the much larger payments associated with primary job responsibilities. We suggest that, in the ESM context, one needs to consider financial incentives for both primary and secondary responsibilities (e.g., additional payments for contributing to the ESM) simultaneously to understand the impact that they have on each other.

One also needs to consider the effect of managerial control mechanisms on knowledge sharing because, unlike on public social media, ESM often contain sensitive work-related information. As a result, organizations are likely to implement controls over ESM in an attempt to mitigate the potential risks associated with its use. For example, Lockheed protects the intellectual assets in its private social networking platform by paying workers to scan other workers' employment-related wikis and blogs for sensitive material (Messmer, 2009). Other organizations rely on acceptable use policies and software rather than humans to police compliance and automatically delete inappropriate materials (Cline, 2008). The effect of such organizational controls on knowledge sharing is unclear.

In summary, we believe that we need to investigate how various incentives (social and financial) interact with different types of managerial control mechanisms (type of moderator) and job setting (nature of compensation for primary work task) to understand the potential for successfully using ESM as a knowledge-sharing platform. However, we must first acknowledge that researchers have demonstrated each of the factors we explore to exhibit mixed results in different contexts. Such conflicts in findings are not unusual in knowledge-sharing studies, and researchers have suggested that one can resolve such conflicts by accounting for how various internal and external incentives interact with one another (Huber, 2001). Therefore, in addition to testing for the main effects of the identified factors, we also account for the influence of internal motivation and for expected interactions among the factors. In the following sections, we briefly review agency theory as an organizing framework for our research model and examine literature related to our key factors to develop our hypotheses.

2.1 Agency Theory

It is possible that the common failure of employees to use ESM to share knowledge reflects a disconnect in goals between management and employees. Management expects employees to share their knowledge freely, while employees ignore this goal in order to pursue others (Constant, Kiesler, & Sproull, 1994). Agency theory provides a framework for thinking about situations in which one party, the principal, has work expectations of another party, the agent (Eisenhardt, 1989). The unit of analysis in these relationships is typically a contract that governs the relationship, and the theory focuses on creating the most efficient contract possible. It allows one to understand managers as designers of incentive mechanisms that lead to desired work outcomes. With respect to the use of ESM for knowledge sharing, agency theory suggests that a proper system of incentives can resolve the issues related to employee performance and that some systems will be more efficient than others based on incentive costs and benefits.

One important challenge that exists in developing incentive systems for employees is that managers have multiple goals, which results in employees' having multiple tasks assigned to them (Holmstrom & Milgrom, 1991). Employees faced with multiple goals set by management are known to only partially fulfill some goals and even abandon some entirely in order to pursue a favored goal—particularly when they perceive that they have limited capacity to do everything (Schmidt & Dolis, 2009). This need to ration their efforts helps to explain why employees that have required tasks to perform as part of their job will not necessarily perform an additional, voluntary task such as contributing knowledge to an ESM platform. They are already working up to their perceived capacities to perform another goal that has an incentive associated with it. The challenge that management faces is how to encourage employees to share knowledge without negatively impacting employee performance on a primary task. In this section, we develop a theoretical model that captures critical elements to developing an incentive system to share knowledge in ESM in a dual-goal working environment whose goals involve completing primary work tasks and sharing knowledge in ESM.

Managers who seek to direct employee activity in the workplace, such as to share knowledge, need to consider what motivates employees. Extrinsic motivation and internalized extrinsic motivation are two important forms of motivation that managers can manipulate in a workplace setting (Ryan & Deci, 2000b). Internalized extrinsic motivation refers to socially derived values and beliefs that an individual holds that influence behavior (Ryan & Deci, 2000b). Internalized extrinsic motivation is characterized by an individual's having a mindset that a particular behavior is valuable, useful, or "the right thing to do" (Deci & Ryan, 1985; Ryan & Deci, 2000a, 2000b). For example, Wasko and Faraj (2000) studied online technical forums and found that some people shared knowledge not because of any inherent pleasure but because they thought it would help others and because helping others was the "right thing to do". Similarly, studies in work contexts have found that believing knowledge sharing has value increases knowledge-sharing behavior (Bock et al., 2005; Bock & Kim, 2002; Coakes, 2004; Lin, 2007).

By influencing an organization's culture, managers can influence the extent to which employees believe that knowledge sharing is important (Constant et al., 1994). Based on the preceding discussion, we predict that employees who believe that knowledge sharing is important are more likely to share knowledge without any overt managerial intervention to have them do so than people who do not share this belief. As such, we hypothesize:

> **H1:** Individuals who believe that sharing knowledge is important make more contributions to ESM than individuals who do not.

The failure of ESM and other forms of knowledge-management systems to meet expectations for knowledge sharing suggests that internalized extrinsic motivation alone is not sufficient. Managers need to provide extrinsic incentives to motivate the desired behavior. Extrinsic rewards need not be financial. As we discuss above, people share lots of information in public social media such as Facebook, Twitter, and YouTube. Although some users of public social media make contributions with the goal of being compensated financially, most users do not expect payment and instead are motivated by social incentives. Prior research has found that social incentives often increase knowledge sharing in work environments and non-work environments (Bock et al., 2005; Chiu, Hsu, & Wang, 2006; DiMicco et al., 2008; Han & Anantatmula, 2007; Hsu, Ju, Yen, & Chang, 2007; Ma & Agarwal, 2007; Marett & Joshi, 2009).

A feature that seems to be ubiquitous across public social media is the ability to react to contributions using "like" or "dislike" signals. Apparently, such a capability satisfies an innate desire to connect with others in order to receive recognition and feedback (Barker, 2009; DiMicco et al., 2008; Lin & Lu, 2011; Markus, Manville, & Agres, 2000; Raacke & Raacke, 2008; Rheingold, 1993). Attempts to increase knowledge sharing by incorporating features and tools found in public social media should, at a minimum, include mechanisms to make both contributions and feedback on those contributions visible. As such, we hypothesize:

> **H2:** The presence of social feedback cues that publically display reactions to contributions increase knowledge sharing in ESM.

Another decision that managers face concerns whether to incorporate human moderators in ESM. Human moderators may be tasked to generate discussion, filter content, and/or maintain civility among users (Hummel & Lechner, 2002; Lazar & Preece, 2002; Phang, Kankanhalli, & Sabherwal, 2009; Preece, 2000). They also can be tasked with corporate surveillance as reflected by the fact that over 60 percent of companies monitor employee communications through means that include recording phone calls and

reviewing email messages (Selnow & Gilbert, 1997). Organizations justify such surveillance as a means of ensuring ethical behaviors (Lindsay, Lindsay, & Irvine, 1996; Tenbrunsel & Messick, 1999) and protecting sensitive data from leaking (Lawton, 2008; Papadimitriou & Garcia-Molina, 2011).

Regardless of the justification for using human moderators, their impact on knowledge sharing depends on the potential contributor's perception of the moderator's role and purpose (Durcikova & Gray, 2009). One possibility is to view the moderator's role as that of a supportive coach whose purpose is to encourage people to make contributions, offer support in making contributions, and review contributions in constructive and open ways. Preece (2001, 2004) argues that the presence of such a nurturing moderator should increase the number of contributions that each member of an online community makes. Phang et al. (2009) empirically verified these arguments in finding that the level of interaction and sharing increased when moderators in an online discussion forum were perceived as encouraging and friendly.

However, tone can also view human moderators as playing the role of "knowledge management police" whose purpose is to ensure adherence to policies and rules by monitoring online activities for events such as ethical violations or disclosure of sensitive information that merit corrective intervention or even punishment. The possibility of punishment, whether or not actually administered, is a distinguishing characteristic of policing moderators. In a working context, punishment could be as minor as eliminating low-quality or duplicate postings (which causes the individuals to have wasted their effort in making the contribution) or as serious as terminating the employee because of unethical behavior or disclosure of sensitive information.

The potential impact of viewing a moderator as a policing authority can be understood through the lens of deterrence theory. Deterrence theory is based on the perspective that people make reasoned decisions regarding a behavior based on perceptions of its costs and benefits (D'Arcy & Herath, 2011). For example, behavioral research on information security has found evidence that the threat of detection and punishment deters employees from violating policy (D'Arcy, Hovav, & Galletta, 2009; Herath & Rao, 2009a, 2009b; Siponen, Willison, & Baskerville, 2008; Straub, 1990). Indeed, the *mere presence* of a sanctioning system makes the cost of violating a policy, whether intentional or unintentional, more salient and serves as a deterrent to undesirable behavior (Tenbrunsel & Messick, 1999).

Research has also found intense monitoring to demotivate people and reduce effort (Barkema, 1995). In addition, some evidence suggests that the *threat* of possible sanctions reduces work output (Fehr & Schmidt, 2007). Thus, the presence of a policing moderator may increase the perceived cost of knowledge sharing (wasted effort, reprimand, or punishment) and, hence, discourage people from taking the time to share knowledge. As such, we hypothesize:

H3a: The presence of a supportive moderator increases knowledge sharing in ESM**.**

H3b: The presence of a policing moderator decreases knowledge sharing in ESM.

2.2 Contingency Theory

Contingency theory argues that no single, best way to make decisions exists. Instead, the best course of action depends on specific contextual factors that affect the relationships between independent and dependent variables (Donaldson, 2001; Drazin & Van de Ven 1985; Hollenbeck et al., 2002; Islam & Hu, 2012). When choosing among competing tasks, many factors contribute to the choice an employee makes, such as the relative difficulty of the tasks, ability relative to the tasks, magnitude of tasks, feedback regarding task performance, peer pressure, and risk aversion; however, income expectation is likely to be paramount when present (Bene & Twefik, 2001; Caraco, 1980; DeHoratius & Raman, 2007; DeShon, Kozlowski, Schmidt, Milner, & Wiechmann, 2004; Northcraft, Schmidt, & Ashford, 2011; Schmidt, Dolis, & Tolli, 2009; Schmidt & DeShon, 2007; Schmidt & Dolis, 2009; Son & Metcalfe, 2000). Therefore, tasks with a greater income expectation (i.e., primary responsibility tasks) will receive more attention than those with little or no income expectation (i.e., voluntary or secondary responsibility tasks), which implies that the payment attached to the completion of primary tasks in a work setting may impact the completion of secondary tasks.

Further, the type of compensation that an organization offers for a primary task may also affect this relationship. The two basic compensation options that employers use are: 1) pay a fixed salary or 2) pay a variable (piece-rate) amount tied to output. A fixed salary provides a weaker link between pay and performance than does a variable or piece-rate compensation plan (Stajkovic & Luthans, 2001) because it implies that, as long as output exceeds a level deemed "satisfactory", pay is not affected, which

constitutes one reason why workers who operate under piece-rate incentive schemes tend to have higher task-performance levels than salaried workers (Lazear, 2000). Piece-rate compensation schemes cause people to constantly think in terms of economic rationality when considering task choice. Doing anything other than the task that generates rewarded output reduces compensation.

Sharing knowledge takes time away from one's primary task. As such, for piece-rate workers, sharing knowledge reduces output and, thereby, expected income. Thus, piece-rate workers who take time to share their knowledge will suffer a reduction in total remuneration. In contrast, salaried workers are likely to incur little, if any, financial penalty for sharing knowledge in ESM. As long they do not spend so much time sharing knowledge that they fail to complete their primary tasks, they will receive their normal compensation. As such, we hypothesize:

H4: People paid a fixed salary for their primary work task make more knowledge contributions using ESM than people paid on a piece-rate basis for their primary work task.

In addition to having a main effect on knowledge sharing, a worker's compensation scheme for a primary work task will also likely affect how the worker responds to various combinations of other motivations to share knowledge. One obvious extrinsic motivator that managers can use to increase knowledge sharing is a financial reward for contributions to the knowledge repository. Generally speaking, workers are economically rational and tend to concentrate their effort on tasks for which they are financially compensated (Bene & Twefik, 2001; DeHoratius & Raman, 2007). In practice, economic rationality means that employees will tend to do what they get paid to do.

This phenomenon extends beyond their primary tasks and applies to potential secondary tasks as well. For example, research has shown that offering monetary compensation increases participation in training and development activities (Maurer & Tarulli, 1994). Thus, even when employees are already paid for a primary job, one can incentivize them to do other tasks as well by offering them monetary payment. Thus, it comes as no surprise that many firms have attempted to increase knowledge sharing through payments that are above and beyond the employee's primary compensation.

Surprisingly, prior research on the effect of financial rewards on knowledge sharing has found mixed results. Some studies have found evidence that paying people to share knowledge is effective (Cabrera et al., 2006; Kankanhalli et al., 2005; Liu et al., 2011), while others have reported that financial incentives do not increase knowledge sharing (Bock et al., 2005; He & Wei, 2009; Lin, 2007). This pattern of mixed results suggests that other contextual factors are at play in organizational settings (Marett & Joshi, 2009). One potentially important factor is the nature of the employee's primary compensation scheme. If we consider the effect of offering piece-rate workers a financial incentive to share knowledge, the financial incentive will most likely be lower than the reward for performing their primary task. Therefore, it still is economically irrational to share knowledge, which may explain why sales people and other types of workers who are compensated on a piece-rate basis are hesitant to spend time on secondary tasks (Davey, 2011). In contrast, offering a salaried person a token payment to share knowledge is a "carrot" that increases their total remuneration. As such, we hypothesize:

H5: Paying people to share knowledge using ESM increases the quantity of knowledge contributions for salaried workers but not for piece-rate workers.

2.3 Self-determination Theory

One can use self-determination theory (SDT) with contingency theory to better understand why the compensation scheme for the primary work task likely interacts with various other motivators for sharing knowledge. According to (SDT), human beings have basic needs that, when met, increase motivation but, when undermined, decrease motivation (Ryan & Deci, 2000b). SDT posits that external incentives can either increase (called "crowding in") or decrease (called "crowding out") the preexisting level of internal motivation (Frey & Jegen, 2001).

Several studies have empirically demonstrated the behavioral impact of crowding effects (Frey & Jegen, 2001; Heyman & Ariely, 2004). Sometimes external incentives increase overall activity levels on tasks, while other times they decrease them. The effect depends on how individuals perceive the external incentives (Frey & Jegen, 2001). If individuals consider an external incentive to complement their existing internal motivations, the external incentive "crowds in" or enhances that motivation; conversely, if they perceive the external incentive as an attempt to control behavior and diminish free will, the external

incentive "crowds out" or reduces the pre-existing level of motivation (Deci, Koestner, & Ryan, 1999; Frey & Obeholzer-Gee, 1997; Osterloh & Frey, 2000).

The situational context affects how a person perceives an extrinsic motivator (Donaldson, 2001; Drazin & Van de Ven, 1985; Hollenbeck et al., 2002). Specifically, the nature of an employee's compensation scheme for performing their primary work task will likely influence how they perceive the value of being paid to share knowledge (a secondary task). As we explain above, knowledge sharing is economically irrational for piece-rate workers because it will reduce their earnings. Nevertheless, piece-rate workers may share knowledge if their internal motivation is strong enough that they are willing to make some sacrifice in order to do something they value (Deci & Ryan, 2000a, 2000b). However, offering a piece-rate worker a financial incentive to share knowledge may remind the piece-rate worker that they will suffer an economic penalty for taking time to share knowledge. Consequently, workers may perceive a token payment for sharing knowledge as an attempt to control their behavior—in essence, a "bribe" to make them act against their self-interest. Thus, offering to pay piece-rate workers to share knowledge may "crowd out" any pre-existing disposition to do so.

In contrast, offering salaried workers a token payment to share knowledge will not decrease their total remuneration. Thus, salaried workers may be more likely to perceive payments for knowledge sharing as "informing" them about the value of their efforts rather than an attempt to coerce their behavior. Accordingly, paying salaried workers to share knowledge should "crowd in" any pre-existing internal motivation to do so. As such, we hypothesize a three-way interaction between primary compensation scheme, financial incentives to share knowledge, and internal beliefs about the importance of sharing knowledge:

H6a: For salaried workers, the combined effect of being paid to share knowledge and believing that knowledge sharing is important will be greater than the sum of the individual effects (i.e., there will be a positive synergistic effect).

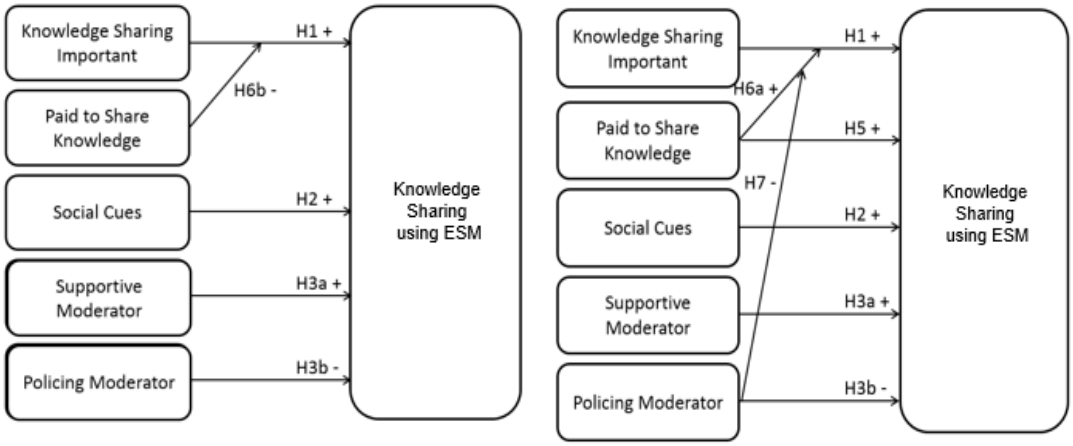
H6b: For piece-rate workers, the combined effect of being paid to share knowledge and believing that knowledge sharing is important will be less than the sum of the individual effects (i.e., there will be a negative synergistic effect).

Another important finding of motivation-crowding research is that multiple sources of motivation may either complement (crowd in) or counteract (crowd out) one another (Ariely, Bracha, & Meier, 2009; Heyman & Ariely, 2004). Because any factor that introduces feelings of control can crowd out internal motivation, the existence of even one controlling factor could potentially undermine the benefits of multiple other factors. Recall that, in H3a and H3b, we hypothesize that a supportive moderator should increase (decrease) knowledge sharing because workers will perceive the moderator as trying to help (as trying to control behavior). Thus, the presence of a policing moderator could undermine a situation that would otherwise be conducive to knowledge sharing. As such, we hypothesize a four-way interaction between primary compensation scheme, paying to share knowledge, internal beliefs about the importance of knowledge sharing, and the presence of a policing moderator:

H7: The presence of a policing moderator undermines the effect of offering payments for knowledge sharing to salaried workers who believe knowledge sharing is important.

2.4 Research Model

Figure 1 summarizes our research model and hypotheses. It highlights the fact that knowledge sharing depends on internal and external factors and that those factors interact with each other. We use separate models for salaried and piece-rate workers because we hypothesize that the effects on knowledge sharing will differ depending on the nature of the compensation scheme for an employee's primary task. Therefore, H4 does not explicitly appear in Figure 1 but is reflected in the differences between the two halves of the model.



Piece-Rate Model **Salaried Model**

Figure 1. Research Model and Hypotheses

3 Methodology

Prior research primarily has used field studies to investigate the factors that influence knowledge sharing. Although field studies possess the advantage of investigating the behavior in its natural setting, they typically do not permit one to comprehensively test how various manipulated factors interact with one another. Moreover, field studies create several potential threats to internal validity (Cook & Campbell, 1979) because managers may justifiably encourage employees to respond to unanticipated events affecting the enterprise's future (loss or gain of an important customer, budget crises, macroeconomic factors affecting revenues or costs, mergers or acquisitions, etc.) in a manner that would confound the desired experimental manipulations.

In addition, it is difficult in an organizational setting to prevent participants who receive different experimental treatments from comparing notes or even providing friends and colleagues the opportunity to access what they perceive as a useful tool. We used a controlled laboratory experiment so that we could investigate the direct and joint effects on knowledge sharing of extrinsic incentives (payment for knowledge sharing and social feedback cues), internal motivation, presence and type of moderator, and nature of compensation scheme for primary task. By using a controlled experiment, we could also eliminate the fear of job loss, which research has shown to inhibit knowledge sharing (Gray, 2001), as a potential confounding factor. We conducted several rounds of pilot testing to refine the details of the experimental task and nature of the treatment conditions.

Our research model posits that several internal and extrinsic motivational factors affect whether an employee chooses to share information using ESM. However, we believe that those factors will affect workers paid on a salary basis differently than workers paid on a piece-rate basis. Because there are so many interactions between the type of compensation scheme and the other relevant experimental variables (social cues, payment for knowledge sharing, type of moderator) and the observational variable (belief that knowledge sharing is important) and because we had enough observations to estimate separate models for subjects paid a fixed salary and subjects paid a piece-rate, we estimated two models. Running the models separately eliminates the need to assume that the variance of the error term is the same for both models (which probably is not true in this case) and the need to create an interaction between compensation scheme and every other independent variable and between compensation scheme and every identified interaction among the other independent variables (Kmenta, 1971; Neter, Wasserman, & Kutner, 1989). Running the models separately makes it easier to interpret coefficient estimates, especially when one has three or four-way interaction terms, and constitutes the main reason why researchers so commonly use split sample regressions.

3.1 Experimental Task

The primary work task required participants to search the Internet to retrieve information of several types, including finance and technology (see Appendix A, Figure A6, for an example of the information retrieval task screen). A website we created for the primary task listed the information that participants were to retrieve and provided a place where participants could record that information[2]. We designed the primary task website to function as a private online document, so only the participant who recorded the retrieved information items for the primary task could see them. This design prevented participants from simply copying someone else's work.

We created a separate website for the secondary task of knowledge sharing. The knowledge-sharing website prominently featured a discussion area that we pre-configured with categories related to the work tasks. In the knowledge-sharing website, all participants could see both the shared knowledge and the comments on the shared knowledge.

3.2 Experimental Design and Variables

We used a 2 x 2 x 2 x 3 analysis of covariance design to test the hypotheses. We randomly assigned participants to each of the 24 treatment combinations. The first manipulated factor was primary task compensation scheme: we informed half of the participants that they would be paid a fixed salary of $30.00 in game money provided that they completed at least one task; we told the other half that they would earn $1.00 in game money for each task they completed. The second manipulated factor was the presence or absence of financial incentives to share knowledge. We told half of the salaried subjects that they would earn an additional 25 cents in game money if they posted one or more items in the community knowledge-sharing website, and we told half of the piece-rate workers that they would earn $0.01 in game money for each knowledge contribution. We told the other subjects that they would not be paid for making knowledge contributions. To be realistic, we deliberately set the payment amount for making a knowledge contribution to be markedly lower than what would be earned for performing the primary task (1% of primary compensation in the case of piece-rate workers, and .83% of primary compensation in the case of salaried workers).

The third manipulated factor was whether social feedback cues were present or absent. We assigned half of the participants to an experimental treatment that appeared to allow them to make comments on the posts of other participants and see feedback comments made in response to knowledge postings created by themselves and others in the community knowledge-sharing website. The other half could neither see nor post any feedback comments on knowledge postings in the community knowledge-sharing website (see Appendix A, Table A6, for an example screenshot of the knowledge-sharing task screen).

To ensure that participants assigned to the social cues feedback condition were not subject to flaming and did not become involved in extended interactions with other participants, the community knowledge-sharing website did not display the knowledge contributions and feedback comments of other participants but rather displayed: 1) system-generated knowledge contributions designed to appear like other participants in the room posted them, 2) favorable feedback comments about the individual's knowledge postings that appeared to be from the other participants but were actually system generated, and 3) a fictitious view counter that indicated how often the individual's knowledge posts were read, which the system periodically increased to provide the appearance of an active social community.

Thus, participants in the social cues feedback treatment saw only their own knowledge posts, their own feedback comments on system-generated knowledge posts, and the system-generated knowledge posts and feedback comments; they did not see the knowledge posts or feedback comments from other participants in the study and could not interact with other participants in the study. Moreover, individuals who were not in the social cues feedback treatment saw only their knowledge posts and system-generated knowledge posts. Showing only system-generated knowledge posts not only prevented unwanted side effects (e.g., flaming) but also allowed us to limit the amount of knowledge entered to a small quantity, so participants would not feel that others had already posted all of the useful information.

[2] Pilot testing indicated that one could retrieve the required information about a company in approximately 30 seconds. Thus, we expected the total remuneration for the salaried and piece-rate workers to be about the same. Moreover, the salaried participants had plenty of time to not only earn their fixed salary but also share knowledge if they so desired.

The fourth manipulated factor, nature of the human moderator, had three levels: none, supportive, or policing. We informed participants in the supportive moderator treatment of the presence of a human moderator who could help them improve a post's clarity and usefulness. We informed participants in the policing moderator treatment of the presence of a moderator who monitored contributions to ensure that they were not inappropriate or offensive but who would also fine the contributor for each item that the moderator had to remove from the knowledge repository. The fine was one dollar in game money for each item that the moderator removed. The amount of the fine was set at approximately three percent of the total expected remuneration for both salaried and piece-rate workers in order to make it salient.

In addition to the four experimental factors, we also had one observational factor: each participant's belief about the importance of sharing knowledge. Research has demonstrated the belief that knowledge sharing has value to an organization to increase knowledge sharing in work contexts (Constant et al., 1994). We collected this data after completion of the experiment as part of the debriefing survey (see Appendix A, Table A9, part 1) in order to avoid sensitizing participants about the value of knowledge sharing and, thereby, biasing our results. We classified each participant as either believing knowledge sharing is more important than the primary task or not believing knowledge sharing is more important than the primary task.

Because we measured participants' beliefs about the importance of sharing knowledge after the experiment concluded, one or more of the manipulated variables could have possibly affected such beliefs. In fact, a key tenet of motivation crowding theory is that extrinsic incentives can either increase (crowd in) or decrease (crowd out) pre-existing internal motivation (Deci et al., 1999; Frey & Jegen, 2001; Frey & Obeholzer-Gee, 1997; Osterloh & Frey, 2000). In Section 4, we explain how we tested whether any of our manipulations affected participants' beliefs about the importance of knowledge sharing.

The dependent variable for our study was the number of knowledge contributions that participants made. The system automatically recorded this information whenever a participant made an entry on the knowledge-sharing website.

3.3 Participants

We recruited 1,410 students in a required business course offered at a major university in the southwestern United States to participate in the experiment. We compensated them with a small amount of extra credit for their participation. In all, 1,222 of the subjects completed the experiment. The 188 students that began but did not complete the experiment either stopped working because their computer ran out of power or failed to complete one of the required steps such as the exit survey.

Researchers have intensely debated the use of students as subjects in experiments for years. Compeau, Marcolin, Kelley, and Higgins (2012) summarize the discussion and present guidelines for determining when the use of students is appropriate. We think that this study satisfies their conditions. First, we examine whether specific manipulations (type of primary compensation scheme, payment for sharing knowledge, absence/presence of social feedback cues, and type of moderator) affect knowledge sharing. A laboratory experiment provides the strongest means of testing for such effects while controlling for possible confounding factors.

Second, the use of students provides the strongest possible test of whether social feedback cues and the type of moderator affect knowledge sharing. Pew Research has found that adults from 18-29 years of age and those with at least some college use social networking websites the most (Pew Research Center, 2017). Thus, students are accustomed to the presence of a variety of social feedback cues (e.g., information about the number of "likes" for a post along with evaluative comments) when using social networks; and would be more likely to notice the absence of such features than would people who use social networks less extensively. If the absence of social feedback cues does not adversely affect undergraduate students, it is not likely to affect older workers in organizations.

Further, research has found evidence that students are more likely to comply with authority than older workers (Sears, 1986), which may reflect the fact that they constantly receive feedback from their instructors. Therefore, students are more likely to notice and react to the presence of moderators. Consequently, students may exhibit a larger positive reaction to the presence of a supportive moderator and be less negatively affected by a policing moderator's presence than older workers, which suggests that moderators may have a larger positive impact (in the case of a supporting moderator) and a lesser negative impact (in the case of a policing moderator) on knowledge sharing by students than by older workers. Thus, as with social feedback cues, using students as subjects in a controlled laboratory

experiment provides a strong test of whether the experimental manipulation (presence of moderator and type of moderator) affects knowledge sharing in the work environment.

Testing whether something can happen, even in a laboratory experiment, is an important step in understanding many phenomena (Mook, 1983). In particular, if a generally held belief (hypothesis) does not hold in a laboratory experiment, then, provided the experiment is internally valid, the theory underlying that hypothesis needs to be revised. Thus, our using students in our laboratory experiment provided an economical way to determine whether researchers who conduct field studies on knowledge sharing using ESM in actual work environments need to further consider two potential non-financial incentives (social feedback cues and moderators).

3.4 Procedures

We randomly assigned participants to one of the experimental conditions. The experiment took place in a large room that seated over 350 people. Participants brought or we loaned them laptops with Internet access. At the beginning of the experiment, we read a script that explained the task (see Appendix B). We then showed the participants the two websites that they would use on projection screens at the front of the room: one website for performing work tasks and another website for sharing knowledge related to the work tasks. We then showed them how to access and interact with each of the websites.

We first asked subjects to register to use the social media website that we created specifically for this experiment. This step required them to create a personal profile that contained information such as their name, gender, hobbies, major, and so on. The system assigned them randomly to one of 24 different treatment combinations. They then read the appropriate treatment scenario informing them 1) how they would be paid for the primary task (salary or piece-rate), 2) whether or not they would be paid for sharing knowledge, 3) whether anyone else could see and respond to any contributions they posted on the knowledge-sharing website, and 4) whether the knowledge base forum would be moderated and, if so, the type of moderator (policing or supporting). Appendix C shows the scenarios.

After reading the scenario, participants had to pass a quiz to demonstrate that they understood it correctly (i.e., that they understood how they were being paid, whether they would be compensated for sharing knowledge, etc.). We gave them unlimited chances to take the quiz but they had to re-read the scenario each time they failed to pass it. When everyone had passed the quiz, we simultaneously gave all participants a start code that allowed them to access the work task and knowledge-sharing websites.

We gave participants 20 minutes to complete the experiment. Pilot testing indicated that a person could complete a primary task (e.g., find a required piece of information for one company) in about 30 seconds. Thus, participants had sufficient time to allocate to sharing their knowledge if they so desired. After 20 minutes, we asked participants to stop working and complete an exit survey (Appendix A, Tables A9 and A10). We then read a debriefing script to them (see end of Appendix B).

4 Results

Technical difficulties (e.g., loss of power to devices, incompatible browser settings, failure to pay attention to directions, etc.) caused 164 people to begin the experiment late, which meant they had less time to perform tasks than the others. Because tests indicated that whether a person started on time or not had both a main effect on knowledge contributions and significantly interacted with the independent variables, we did not include subjects that started late in the analyses we used to test our hypotheses. We also eliminated another 290 participants because they incorrectly answered one or more manipulation check questions in the exit survey (e.g., incorrectly recalled whether they were paid to share knowledge, etc.)[3]. We also removed one additional participant who was paid piece-rate and appeared to have tried to game the results by posting every task accomplished as a knowledge contribution. Thus, the results we report are based on 767 participants.

Table 1 shows that the participants were, on average, 18.8 years' old and that 56 percent were male. On average, participants completed nearly 31 primary tasks. Thirty percent of participants made at least one knowledge contribution; of those who did, the average number of contributions was 3.1. In the post-

[3] Results were similar for analyses that included the 290 participants who answered one or more exit survey questions incorrectly, but, to be conservative, in our tests, we present the results for only the participants who passed all manipulation checks.

experiment debriefing, 22 percent of respondents indicated that they thought the knowledge contribution task was more important than the primary task, which shows that a sizeable number of respondents were internally motivated to share knowledge.

Table 1. Descriptive Statistics

Variable	Mean	Standard deviation	Sample size
Age	18.81	2.34	767
Sex (0 = female, 1 = male)	.56	.50	767
Primary tasks completed	30.77	19.97	767
Knowledge tasks completed (all)	.92	2.54	767
Knowledge tasks completed (those who contributed)	3.07	3.87	229
Believe knowledge sharing is important (0 = no, 1 = yes)	.22	.42	767

4.1 Manipulation Checks

As we explain above, we conducted our analyses only on participants who, during the post-experiment debriefing, indicated that they correctly understood what treatments they had received. In addition, during the debriefing, we explained that, to ensure that everyone received the same type and quantity of periodic social feedback, the system would display information about the number of times people had viewed a contribution and post evaluative statements about those contributions. Oral comments from participants during the debriefing indicated they were surprised to learn that the feedback came from a computer, which suggests that the social cues were realistic. Furthermore, those participants whom we told would receive piece-rate compensation for the primary task completed more work tasks than did participants whom we told would be paid a fixed salary (33.9 versus 27.6, respectively, $p < .001$, 95% confidence limits for difference are 3.5 to 9.1), which indicates that our manipulation of the primary task compensation scheme was salient and affected participants' behaviors.

4.2 Determinants of Knowledge Sharing

In each compensation scheme, we used regression analysis to test the effects of the experimental treatments on knowledge sharing using ESM. To simplify interpretation of the regression results, we coded belief that knowledge sharing is important (KSI), payment to share knowledge (PSK), social feedback cues (SOC), and being paid a salary (SAL) as a binary: 1 indicated that the factor was present, and 0 indicated that it was not. We also created two dummy variables to represent the presence (absence) of a supportive moderator (SM) or a policing moderator (PM). Tables 2 and 3 display the results for both salaried and piece-rate treatments.

Table 2. Descriptive Statistics

	B	Std. error	t-value	p-value	95% C.L.
Constant	.240	.340	.706	.481	-.43 to .91
KSI (H1)	1.354	.484	2.798	.005	.40 to 2.30
SOC (H2)	-.254	.295	-.861	.390	-.84 to .33
SM (H3a)	.258	.360	.715	.475	-.46 to .97
PM (H3b)	.215	.382	.563	.574	-.54 to .97
PSK (H5)	.822	.347	2.369	.018	.14 to 1.50
PSK*KSI (H6a)	2.884	.743	3.882	.000	1.42 to 4.34
PSK*KSI*PM (H7)	-2.851	.875	-3.259	.001	-4.57 to -1.13
n = 379, adjusted R square = .186, F = 13.339, p-value = .000					

Table 3. Descriptive Statistics

	B	Std. error	t-value	p-value	95% C.L.
Constant	.353	.189	1.865	.063	-.02 to .72
KSI (H1)	1.071	.308	3.478	.001	.47 to 1.68
SOC (H2)	-.266	.164	-1.624	.105	-.59 to .06
SM (H3a)	.054	.198	.271	.786	-.34 to .44
PM (H3b)	-.075	.198	-.379	.705	-.46 to .32
PSK (H5)	.402	.181	2.218	.027	.05 to .76
PSK*KSI (H6b)	-.218	.419	-.520	.603	-1.04 to .61
n = 388, adjusted R square = .056, F = 4.845, p-value = .000					

4.3 Hypothesis Tests

Tables 2 and 3 display the p-values for the tests of all our hypotheses except H4, which we discuss after. H1 posits that people who believe that knowledge sharing is important (KSI) make more knowledge contributions using ESM than those who do not share that belief. As Tables 2 and 3 show, the main effect for KSI was positive and significant as H1 posits. As we expected, both piece-rate and salaried workers made more contributions when they believed knowledge sharing is important. Moreover, the low p-values for the tests were not simply an artifact of the relatively large sample sizes. The average amount of knowledge sharing for the two groups was 0.60 for the piece-rate group and 1.25 for the salary group. The magnitudes of the point estimates for the effect of believing that knowledge sharing is important were 1.071 and 1.354, respectively, which indicates more than a doubling of the quantity of knowledge sharing for both groups. This situation is not one where the result is statistically significant but of no practical importance.

H2 posits that the presence of social feedback cues (SOC) increases knowledge sharing using ESM. Tables 2 and 3 show that the coefficient for SOC was not significant and even that it had the wrong sign for both salaried and piece-rate workers. Thus, the results indicate that social cues do not appear to provide any incentive to share knowledge.

H3a and H3b posit that the presence of a supportive (policing) moderator (SM and PM, respectively) increases (decreases) knowledge sharing. Tables 2 and 3 show that the coefficients for SM and PM were not even close to being significant for either salaried or piece-rate workers. Thus, the results indicate that human moderators do not appear to provide any direct incentive or disincentive to share knowledge.

H5 posits that paying people to share knowledge (PSK) increases the quantity of knowledge contributions for salaried workers but not for piece-rate workers. Tables 2 and 3 show that the coefficient for PSK was significant for both salaried and piece-rate workers. As we point out above, the average amount of knowledge sharing for the two groups was 0.60 for the piece-rate group and 1.25 for the salary group. The magnitudes of the point estimates for the effect of being paid to share knowledge were 0.402 for the piece-rate group and 0.822 for the salaried group—a more than a 50 percent increase in the quantity of knowledge sharing for both groups. This result is statistically significant and practically important. Thus, the results only partially agree with our expectations since being paid to share knowledge had an effect on knowledge sharing not only for participants in the salaried treatment but also for those in the piece-rate treatment.

H6a posits a positive synergistic effect between being paid to share knowledge (PSK) and the belief that knowledge sharing is important (KSI) for salaried workers, and H6b posits a negative synergistic effect between PSK and KSI for piece-rate workers. For salaried workers, Table 2 shows a large and statistically significant effect (p = .000). Moreover, the magnitude of the coefficient for PSK*KSI (2.884) was more than twice the average amount of knowledge sharing (1.25), which indicates that the effect is practically important and statistically significant. In contrast, for piece-rate workers, Table 3 shows no synergy between PSK and KSI (p = .603). Thus, the results agree with our expectations for H6a but not for H6b.

H7 posits that, for salaried workers, the presence of a policing moderator (PM) undermines the positive effects of workers' believing that knowledge sharing is important (KSI) and paying workers to share knowledge (PSK). Table 2 shows that the results concur with this hypothesis (p = .001). The coefficient for

PSK*KSI*PM (-2.851) had almost the same magnitude as the coefficient for PSK*KSI (2.884) but the opposite sign. Thus, our results indicate that the presence of a policing moderator almost completely nullifies the synergy between PSK and KSI.

Note also that, in Tables 2 and 3, the constant term was not significant at the 0.05 level for either salaried ($p = .481$) or piece-rate workers ($p = .063$). Although we made no hypothesis about the constant term, we can reasonably expect that, if workers do not feel knowledge sharing is important and do not receive any external incentives to share knowledge (the subjects in the baseline category), then they will not share any knowledge. The non-significance of the constant term confirms this expectation.

H4 posits that people paid a fixed salary for their primary work task make more knowledge contributions using ESM than people paid on a piece-rate basis. Because Table 2 reports separate results for the salaried and piece-rate treatment groups, it does not contain a test for hypothesis H4. To test H4, we ran an independent groups t-test that did not assume equal variances for the two groups. Because we randomly assigned subjects to the two groups, the assumptions for this test were satisfied. The mean and standard deviation for the salaried group were 1.25 and 3.169, respectively. The mean and standard deviation for the piece-rate group were .60 and 1.651, respectively. The p-value for the test of the difference between the means was $p < .001$, and the 95 percent confidence limits for the difference were .293 to 1.012. Because belief that knowledge sharing is an observational variable rather than an experimental variable (and, hence, could differ for the two groups), we also ran a regression analysis with knowledge contributions as the dependent variable and compensation scheme and belief that knowledge sharing is important as the independent variables. Table 4 shows the results.

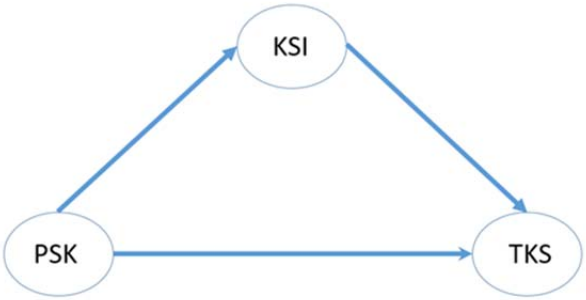
In Table 4, the 95 percent confidence limits for the difference in knowledge sharing due to the compensation scheme were .180 to .867 rather than .293 to 1.012. This shift arose due to the fact that a higher percent of the persons in the paid salary group (versus the paid piece-rate group) believed that knowledge sharing is important. Part of the difference in knowledge sharing between the two groups arose due to the difference in the percent of the number of people who believed knowledge sharing is important.

Table 4. Regression Results for Piece-rate versus Salary Workers

	B	Std. error	t-value	p-value	95% C.I.
Constant	.263	.129	2.045	.041	.011 to .515
KSI (H1)	1.767	.209	8.436	.000	1.356 to 2.178
SAL (H4)	.524	.175	2.996	.003	.180 to .867
n = 767, adjusted R square = .098, f = 42.615, p-value = 000.					

The difference in the percent of the number of people who believed knowledge sharing is important could have resulted from chance or from a relationship between compensation scheme and the belief that knowledge sharing is important. Therefore, we tested whether any of our manipulations affected participants' beliefs about the importance of knowledge sharing. We found that paying to share knowledge and primary compensation affected those beliefs. Participants paid on a piece-rate basis for the primary work task were less likely to think that knowledge sharing is important than participants paid a fixed salary (19% versus 26%, $p = .011$). In addition, participants paid to share knowledge were more likely to think knowledge sharing is important than did those who were not paid to share knowledge (25% versus 20%, $p = .034$).

We then investigated whether participants' beliefs about the importance of knowledge sharing (KSI) mediated the effect of paying to share knowledge (PSK). We modeled KSI as a mediating variable for PSK when predicting the total amount of shared knowledge (TKS) for both salaried and piece-rate workers (see Figure 2).



$TKS = b_{10} + b_{11}PSK + e_1$
$TKS = .386 + .408*PSK + e_1$ (Piece-Rate, $p = .015$ for b_{11})
$TKS = .558 + 1.530*PSK + e_1$ (Salaried, $p = .000$ for b_{11})

$KSI = b_{20} + b_{21}PSK + e_2$
$KSI = .175 + .026*PSK + e_2$ (Piece-Rate, $p = .507$ for b_{21})
$KSI = .216 + .099*PSK + e_2$ (Salaried, $p = .028$ for b_{21})

$TKS = b_{30} + b_{31}PSK + b_{32}KSI + e_3$
$TKS = .226 + .383*PSK + .921*KSI + e_3$ (Piece-Rate, $p = .019$ for b_{31}, $p = .000$ for b_{32})
$TKS = .066 + 1.304*PSK + 2.273*KSI + e_3$ (Salaried, $p = .000$ for b_{31}, $p = .000$ for b_{32})

Figure 2. Mediation Model for KSI

For salaried workers, the paths from paying to share knowledge to belief that knowledge sharing is important, from paying to share knowledge to total amount of knowledge shared, and from belief that knowledge sharing is important to total amount of knowledge shared were all significant. Note, however, that, although the mediation effect was significant at the .02 level according to the Sobel test, the mediation was only partial and accounted for only a very small part of the relationship between PSK and TKS. In fact, the reduction in the coefficient from PSK to TKS (from 1.530 to 1.304) was only around 15 percent. Consequently, our results concerning the individual and joint effects of PSK and KSI on TKS remain valid.

For the piece-rate workers, the paths from paying to share knowledge to total amount of knowledge shared and from belief that knowledge sharing is important to total amount of knowledge shared were significant; however, the path from paying to share knowledge to belief that knowledge sharing is important was not. The Sobel test also shows that the mediation effect of KSI on PSK was not significant ($p = .26$). Thus, for piece-rate workers, our results suggest that being paid to share knowledge does not impact the belief that knowledge sharing is important.

Because we constructed separate models for salaried and piece-rate workers, we did not need to construct a mediation model for the compensation scheme. However, as we note above, participants paid on a piece-rate basis for the primary work task were less likely to think that knowledge sharing is important than participants paid a fixed salary (19% versus 26%, $p = .011$). This finding supports the need to use a contingency approach that accounts for important contextual factors such as the primary compensation scheme when assessing the impact of managerial interventions designed to increase knowledge sharing.

5 Discussion

We conducted a controlled experiment to investigate the individual and joint effects on knowledge sharing of extrinsic incentives (being paid to share knowledge and presence of social feedback cues), internal belief about the importance of sharing knowledge, human moderators, and nature of the compensation scheme (salaried or piece-rate) for the primary work task. Table 5 summarizes our results. They contribute to both theory and practice and have various important implications for both theory and practice.

Table 5. Summary of Results

Hypotheses	Result
H1: Individuals who believe that sharing knowledge is important make more contributions to ESM than individuals who do not.	Supported
H2: The presence of social feedback cues that publically display reactions to contributions increase knowledge sharing in ESM.	Not supported
H3a: The presence of a supportive moderator increases knowledge sharing in ESM.	Not supported
H3b: The presence of a policing moderator decreases knowledge sharing in ESM.	Not supported
H4: People paid a fixed salary for their primary work task make more knowledge contributions using ESM than people paid on a piece-rate basis for their primary work task.	Supported
H5: Paying people to share knowledge using ESM increases the quantity of knowledge contributions for salaried workers but not for piece-rate workers.	Supported
H6a: For salaried workers, the combined effect of being paid to share knowledge and believing that knowledge sharing is important will be greater than the sum of the individual effects (i.e., there will be a positive synergistic effect).	Supported
H6b: For piece-rate workers, the combined effect of being paid to share knowledge and believing that knowledge sharing is important will be less than the sum of the individual effects (i.e., there will be a negative synergistic effect).	Not supported
H7: The presence of a policing moderator undermines the effect of offering payments for knowledge sharing to salaried workers who believe knowledge sharing is important.	Supported

5.1 Contributions to Theory

This research clarifies several issues about our understanding of using enterprise social media as knowledge-management systems. First, the belief that knowledge sharing is important led to increases in knowledge sharing across all experimental conditions. By itself, this finding supports other studies that have demonstrated that positive attitudes toward knowledge sharing play a central role in knowledge-sharing outcomes in ESM (e.g., He & Wei, 2009; Lin, 2007; Mettler & Winter, 2015; Vuori & Okkonen, 2012). To this existing knowledge, our results suggest that belief in the importance of knowledge sharing is more impactful for salaried workers than for piece-rate employees because employees who share the same internal motivations toward knowledge sharing at work act differently in the face of different financial incentive systems. Employees who are pre-disposed to share knowledge will do so but with less frequency when it hurts them financially.

Another important contribution about belief in the importance of knowledge sharing is that this belief interacts with other interventions that employers use. Most saliently, a super-additive effect occurs when salaried workers with this belief receive payment for sharing knowledge. Although we did not specifically measure changes in intrinsic motivation, we believe that we can attribute the increase in knowledge-sharing activity to the effects of "crowding in" intrinsic motivation. Salaried workers who were already positively inclined toward knowledge sharing experienced an incentive to do just that, and this complement to their motivation increased their sharing levels. Thus, we learn that crowding in is an important effect that occurs in the workplace and that future research should consider it. Scholars should view beliefs about knowledge sharing as a key component in knowledge-sharing studies that use ESM because of its individual impact and its inherent potential to be crowded in and enhanced by appropriate motivations.

Another key area our research addresses concerns the impact of social factors on knowledge sharing. We found that neither a platform's technical capability to allow for content feedback nor individuals' expecting feedback on posted content increased knowledge sharing. This finding provides evidence that ESM is not the same as non-work social media (Facebook, Twitter) in which a sense of belonging, strong social ties, personal validation, and other similar social factors (see Chai & Kim, 2012; Lampe et al., 2006; Ma & Agarwal, 2007; Subrahmanyam et al., 2008) are normally considered the only drivers of knowledge sharing. Ellison et al. (2015) suggests that ESM differ from non-work social media based on dimensions that include their design, audience, and use goals. More specifically, they argue that corporations exert heavy influences over the social networks that they sponsor and that these influences affect their configurations, how they organize users, and the tasks that users focus on. Ellison et al. further argue that

ESM users could use the technology platforms for both individual affordances common to non-work social media (e.g., entertainment and relationship building) and organizational affordances (e.g., completing work-related tasks and goals), but that organizational affordances should dominate the platform use. To these assertions, we add empirical evidence that work-related tasks do in fact dominate in ESM and further show that the very nature of a working environment changes the effectiveness—indeed, eliminates the effectiveness—of social factors as primary drivers of knowledge sharing.

Financial incentives' positive impact on knowledge contributions also represents a key finding from our research. Previously, researchers have found widely discrepant answers to whether financial incentives matter for knowledge sharing in ESM (Bock et al., 2005; Cabrera et al., 2006; He & Wei, 2009; Kankanhalli et al., 2005; Lin, 2007; Liu et al., 2011; Mettler & Winter, 2015; Vuori & Okkonen, 2012). We carefully designed our study to block out possible confounding factors and found that financial incentives, even trivially small ones, had a dramatic impact on participants' knowledge-sharing activity. This finding resolves the debate about whether financial incentives increase knowledge sharing. Our research approach also highlights differences in prior studies that led to different results. Notably, studies that found increases in knowledge sharing attributable to monetary rewards collected data on actual observed behaviors, while those that did not find increases in knowledge sharing attributable to financial rewards tested attitudes toward knowledge sharing. Our findings support the reasoning that Liu et al. (2011) make that financial rewards favorably alter behaviors but not attitudes about knowledge sharing.

To our knowledge, this study is the first to consider the impact of organizational controls in the ESM context. We contribute to theory in this space by demonstrating that a conspicuous form of knowledge policing (as opposed to support) offsets ideal conditions for knowledge sharing among salaried workers. We attribute the negative impact to a "crowding out" effect that occurs as a result of attempts to control human behavior through the threat of a penalty. Hence, when conditions that support both "crowding in" and "crowding out" exist simultaneously, the latter wins. We note that our policing moderators' actions are associated specifically with imposing financial penalties for inappropriate knowledge contributions. In contrast, supportive moderators in our study could filter knowledge contributions but could not impose financial penalties. As such, monitoring does not measurably harm knowledge sharing, but threats of financial penalties will. Given that organizations need to control their knowledge assets, they should see good news in our finding that control is not always negative. Further, in their field studies, researchers will need to account for forms of organizational control of knowledge contributions that we now know to either be benign or hostile to knowledge-sharing activity.

5.2 Managerial Implications

Our findings have important implications for managers who might be considering interventions designed to increase knowledge sharing. In this section, we elaborate on which findings should be important to practitioners and why. We also suggest courses of action specific to those findings.

Our results indicate that the internal belief that knowledge sharing is important is a critical factor that, in isolation, drives more knowledge sharing than any other factor and, in combination with other factors, determines their effectiveness. Thus, managers should take steps to foster this belief. Our results suggest that more than just encouraging employees to do something because they want them to do it, managers should instill a belief in employees that sharing knowledge is fundamentally the right thing for them to do.

Consistent with prior research (Cabrera et al., 2006; Kankanhalli et al., 2005; Liu et al., 2011), we also found that offering financial incentives to share knowledge increased the number of contributions individuals made to a knowledge base. This effect occurred even though the size of the financial incentive was small compared to the rewards for performing the primary work task. The decision to pay workers to share knowledge is something over which managers have control.

Interestingly, our analysis (see the last few paragraphs in Section 4) suggests that paying salaried workers to share knowledge increases both how much knowledge they share and the likelihood that they think knowledge sharing is important. Moreover, for salaried workers, the joint effect of being paid to share knowledge and believing that knowledge sharing is important is super-additive. Thus, at least for salaried workers, our results suggest the possibility of creating a "virtuous circle" where paying to share knowledge not only directly increases knowledge sharing but also indirectly does so by positively influencing attitudes about the importance of knowledge sharing (Garud & Kumaraswamy, 2005).

Another important finding with practical application is that the payment scheme is an important contextual factor that either enhances or diminishes the likelihood that an individual will share knowledge.

Organizations should find this result interesting given that they often rely on sales people and their critical knowledge of customers to drive the majority of their income. Unfortunately, piece-rate payment schemes lower the effectiveness of other motivational factors and appear to limit knowledge sharing. Organizations can both increase the degree to which individuals believe in the importance of knowledge sharing and offer payments for doing so, although these strategies will not have as much impact without also altering the payment scheme.

We also hypothesized and found evidence that adding the wrong managerial intervention to the mix can undo much of the synergistic effect of the combination of having salaried work, believing that knowledge sharing is important, and receiving payment for knowledge sharing. Specifically, for salaried workers, our results show a significant *negative* interaction between being paid to share knowledge, believing that knowledge sharing is important, and the presence of a policing moderator who monitors knowledge contributions and sanctions people who make inappropriate ones. This result occurred despite the fact that the perceived human moderators in our experiment did not actually apply any penalties to any participant. Thus, the mere *threat* of possible sanctions had a demotivating effect in that it reduced the number of knowledge contributions made by salaried workers who believed knowledge sharing is important and who received payment to share their knowledge. This finding agrees with prior research that has found that the threat of sanctions affects work output (Barkema, 1995; Fehr & Schmidt, 2007). Clearly, managers must think carefully about using such controls. When tone needs to police knowledge contributions, we suggest that one do so in as benign a manner as possible. Further, when one needs to intervene, we suggest one do so with discretion so as to not undermine the motivation of potential knowledge contributors.

Our study also indicates that social features alone are insufficient to drive knowledge sharing via ESM. Therefore, managers should not assume that adopting a knowledge-management system with social features will solve previous problems with knowledge sharing. Managers need to focus on other factors, such as the ones we have demonstrated to be impactful, to make the platform effective. It is not as simple as setting up the platform and letting it manage itself: one needs to consciously manage the platform with appropriate incentives.

In summary, our results suggest that no “silver bullet” for encouraging knowledge sharing exists. However, paying people to share knowledge helps, and so does the belief that knowledge sharing is important. Moreover, we found evidence for strong synergistic effects between paying people to share knowledge and the belief that knowledge sharing is important. However, managers need to adopt a contingency theory perspective when pondering how to increase knowledge sharing using enterprise social media. In some situations, adding a single extrinsic factor can have strong positive effects, but adding an additional extrinsic factor can undo those benefits.

5.3 Limitations

We used a controlled laboratory experiment to investigate the effect of various potential motivating incentives on knowledge sharing. In doing so, we could manipulate and rigorously test all possible combinations of treatments in a manner that would not be feasible in a field study. However, our controlled experiment looked at only the short-term effects of manipulations and lacked any significant career consequences (e.g., promotion or dismissal) that would exist in an organizational setting. Thus, future research should investigate how the presence of such additional long-term motivators might affect our results.

The majority of participants in our study were under the age of 21. Some evidence shows that younger people and, in particular, those who grew up with the Internet and social media (digital natives) differ from people who did not have much or any exposure to those technologies until they became adults (digital immigrants) in how they respond to various attempts to influence their use of technology (Vodanovich, Sundaram, & Myers, 2010). Our results are valuable because they suggest how people who are currently entering the workforce will likely respond to various incentives to share knowledge. However, future research should investigate whether the factors we found to significantly influence knowledge sharing among young adults similarly influence older workers.

6 Conclusion

In conclusion, our study offers a deeper understanding about the complex interactions among the factors that impact knowledge sharing in ESM. Although some factors (e.g., paying to share knowledge and

believing that knowledge sharing is important) do have positive individual effects on the amount of knowledge sharing that occurs, interactions among these and other controllable factors are even more important. In particular, for people paid a fixed salary, we found a super-additive joint effect of being paid to share knowledge and believing that knowledge sharing is important. Therefore, instead of searching for a single “silver bullet” that will lead organizations to successfully implement knowledge-management systems based on ESM, our results suggest the need for IS researchers to systematically investigate the relative efficacy of different combinations of internal and extrinsic motivators for stimulating knowledge sharing. We believe that such an approach will eventually culminate in a well-articulated contingency model that managers can use to design appropriate combinations of incentives for knowledge sharing that best fit the culture and goals of their organizations.

References

Alali, H., & Salim, J. (2011). Information system success and acceptance theories: Towards developing a virtual communities of practice success model. In *Proceedings of the International Conference on Semantic Technology and Information Retrieval* (pp. 306-312).

Ariely, D., Bracha, A., & Meier, S. (2009). Doing good or doing well? Image motivation and monetary incentives in behaving prosocially. *The American Economic Review*, *99*(1), 544-555.

Barkema, H. G. (1995). Do job executives work harder when they are monitored? *Kyklos, 48*, 19-42.

Barker, V. (2009). Older adolescents' motivations for social network site use: The influence of gender, group identity, and collective self-esteem. *CyberPsychology and Behavior*, *12*(2), 209-213.

Bene, C., & Twefik, A. (2001). Fishing effort allocation and fishermen's decision making process in a multi-species small-scale fishery: Analysis of the conch and lobster fishery in Turks and Caicos Islands. *Human Ecology*, 29(2), 157-186.

Bock, G. W., & Kim, Y. G. (2002). Breaking the myths of rewards: An exploratory study of attitudes about knowledge sharing. *Information Resource Management Journal*, *15*(2), 14-21.

Bock, G., Zmud, R., Kim, Y., & Lee, J. (2005). Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. *MIS Quarterly, 29*(1), 87-111.

Bush, A., & Tiwana, A. (2005). Designing sticky knowledge networks. *Communications of the ACM, 48*(5), 67-71.

Cabrera, A., Collins, W. C., & Salgado, J. F. (2006). Determinants of individual engagement in knowledge sharing. *The International Journal of Human Resource Management*, *17*(2), 245-264.

Caraco, T. (1980). On foraging time allocation in a stochastic environment. *Ecology, 61*(1), 119-128.

Chai, S., & Kim, M. (2012) A socio-technical approach to knowledge contribution behavior: An empirical investigation of social networking sites users. *International Journal of Information Management*, *32*(2), 118-126.

Chai, K. H., & Nebus, J. (2012). Personalization or codification? A marketing perspective to optimize knowledge reuse efficiency. *IEEE Transactions on Engineering Management, 59*(1), 33-51.

Chin, C. P. Y., Evans, N., & Choo, K. K. R. (2015). Exploring factors influencing the use of enterprise social networks in multinational professional service firms. *Journal of Organizational Computing and Electronic Commerce*, *25*(3), 289-315.

Chiu, C. M., Hsu, M. H., & Wang, E. T. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems*, *42*(3), 1872-1888.

Cline, J. (2008). Planning a company social network? Don't forget privacy issues. *Computerworld,* Retrieved from http://www.computerworld.com/s/article/9076678/Planning_a_company_social_network_Don_t_forget_privacy_issues?taxonomyId=84&pageNumber=1

Coakes, E. (2004). Knowledge management: A primer. *Communications of the Association for Information Systems*, *14*, 406-489.

Compeau, D., Marcolin, B., Kelley, H., & Higgins, C. (2012). Generalizability of information systems research using student subjects—a reflection on our practices and recommendations for future research. *Information Systems Research*, *23*(4), 1093-1109.

Cone, E. (2007). Social networks at work promise bottom-line results. *CIO Insight.* Retrieved from http://www.cioinsight.com/c/a/Trends/Social-Networks-at-Work-PromisebrBottomLine-Results/

Constant, D., Kiesler, S., & Sproull, L. (1994). What's mine is ours, or is it? A study of attitudes about information sharing. *Information Systems Research*, *5*(4), 400-421.

Cook, T. D., & Campbell, D. T., (1979). *Quasi-experimentation: Design & analysis issues for field settings.* Boston: Houghton Mifflin.

D'Arcy, J., & Herath, T. (2011). A review and analysis of deterrence theory in The IS security literature: Making sense of the disparate findings. *European Journal of Information Systems*, *20*(6), 643-658.

D'Arcy, J., Hovav, A., & Galletta, D. (2009). User awareness of security countermeasures and its impact on information systems misuse: A deterrence approach. *Information Systems Research*, *20*(1), 79-98.

Davey, N. (2011). Why do salespeople hate CRM—and how can we help them love it? *MyCustomer.com*. Retrieved from http://www.mycustomer.com/topic/marketing/why-do-salespeople-hate-crm-and-how-can-we-get-them-using-it/133778

Deci, E. L., & Ryan, R. M. (1985) *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Deci, E., Koestner, R., & Ryan, R. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, *125*(6), 627-668.

DeHoratius, N., & Raman, A. (2007). Store manager incentive design and retail performance: An exploratory investigation. *Manufacturing and Service Operations Management*, *9*(4), 518-534.

Denyer, D., Parry, E., & Flowers, P. (2011). "Social", "open" and "participative"? Exploring personal experiences and organisational effects of enterprise 2.0 use. *Long Range Planning*, *44*(5-6), 375-396.

DeShon, R., Kozlowski, S., Schmidt, A., Milner, K., & Wiechmann, D. (2004). A multiple-goal, multilevel model of feedback effects on the regulation of indivdual and team performance. *Journal of Applied Psychology, 89*(6), 1035-1056.

DiMicco, J., Millen, R., Geyer, W., Dugan, C., Brownholtz, B., & Muller, M. (2008). Motivations for social networking at work. In *Proceedings of the Conference on Computer Supported Cooperative Work* (pp. 711-720).

DiMicco, J. M., Geyer, W., Millen, D. R., Dugan, C., & Brownholtz, B. (2009). People sensemaking and relationship building on an enterprise social network site. In *Proceedings of the 42nd Hawaii International Conference on System Sciences* (1-10).

Donaldson, L. (2001). *The contingency theory of organizations*. Thousand Oaks, CA: Sage.

Drazin, R., & Van de Ven, A. H. (1985). Alternative forms of fit in contingency theory. *Administrative Science Quarterly*, *30*, 514-539.

Durcikova, A., & Gray, P. (2009). How knowledge validation processes affect knowledge contribution. *Journal of Management Information Systems*, *25*(4), 81-108.

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, *14*(1), 57-74.

Ellison, N. B., Gibbs, J. L., & Weber, M. S. (2015). The use of enterprise social network sites for knowledge sharing in distributed organizations: The role of organizational affordances. *American Behavioral Scientist*, *59*(1), 103-123.

Fehr, E., & Schmidt, K. M. (2007). Adding a stick to the carrot? The interaction of bonuses and fines. *American Economic Review, 97*(2), 177-181.

Frey, B. S., & Jegen, R. (2001). Motivation crowding theory. *Journal of Economic Surveys*, *15*(5), 589-611.

Frey, B., & F. Oberholzer-Gee (1997). The cost of price incentives: An empirical analysis of motivation crowding-out. *The American Economic Review*, *87*(4), 746-755.

Garud, R., & Kumaraswamy, A. (2005). Vicious and virtuous circles in the management of knowledge: The case of Infosys Technologies. *MIS Quarterly*, *29*(1), 9-33.

Gray, P. (2001). The impact of knowledge repositories on power and control in the workplace. *Information Technology and People*, *14*(4), 368-384.

Han, B. M., & Anantatmula, V. S. (2007). Knowledge sharing in large IT organizations: A case study. *Vine*, *37*(4), 421-439.

He, W., & Wei, K. (2009). What drives continued knowledge sharing? An investigation of knowledge-contribution and -seeking beliefs. *Decision Support Systems*, *46*(4), 826-838.

Herath, T., & Rao, H. R. (2009a). Protection motivation and deterrence: A framework for security policy compliance in organisations. *European Journal of Information Systems*, *18*(2), 106-125.

Herath, T., & Rao, H. R. (2009b). Encouraging information security behaviors in organizations: Role of penalties, pressures and perceived effectiveness. *Decision Support Systems*, *47*(2), 154-165.

Heyman, J., & Ariely, D. (2004). Effort for payment a tale of two markets. *Psychological Science*, *15*(11), 787-793.

Hollenbeck, J. R., Moon, H., Ellis, A. P., West, B. J., Ilgen, D. R., Sheppard, L., Porter C.O., & Wagner, J. A. (2002). Structural contingency theory and individual differences: Examination of external and internal person-team fit. *Journal of Applied Psychology*, *87*(3), 599-606.

Holmstrom, B., & Milgrom, P. (1991). Multitask principal-agent analyses: Incentive contracts, asset ownership, and job design. *Journal of Law, Economics, & Organization*, *7*, 24-52.

Hsu, M. H., Ju, T. L., Yen, C. H., & Chang, C. M. (2007). Knowledge sharing behavior in virtual communities: The relationship between trust, self-efficacy, and outcome expectations. *International Journal of Human-Computer Studies*, *65*(2), 153-169.

Huber, G. P. (2001). Transfer of knowledge in knowledge management systems: Unexplored issues and suggested studies. *European Journal of Information Systems*, *10*(2), 72-79.

Hummel, J., & Lechner, U. (2002). Social profiles of virtual communities. In *Proceedings of the International Hawaiian Conference on System Sciences*.

Islam, J., & Hu, H. (2012). A review of literature on contingency theory in managerial accounting. *African Journal of Business Management*, *6*(15), 5159-5164.

Kankanhalli, A., Tan, B., & Wei, K. (2005). Contributing knowledge to electronic knowledge repositories: An empirical investigation. *MIS Quarterly, 29*(1), 113-143.

Kmenta, J. (1971). *Elements of econometrics*. New York: Macmillan.

Lampe, C., Ellison, N., & Steinfield, C. (2006). A face (book) in the crowd: Social searching vs. social browsing. In *Proceedings of the Conference on Computer Supported Cooperative Work* (pp. 167-170).

Lawton, G. (2008). New technology prevents data leakage. *Computer*, *41*(9), 14-17.

Lazar, J., & Preece, J. (2002). Social considerations in online communities: Usability, sociability and success factors. In H. van Oostendorp (Ed.), *Cognition in the digital world*. New Jersey: Lawrence Erlbaum Associates.

Lazear, E. P. (2000). Performance pay and productivity. *American Economic Review*, *90*(5), 1346-1361.

Lin, H. F. (2007). Effects of extrinsic and intrinsic motivation on employee knowledge sharing intentions. *Journal of Information Science*, *33*(2), 135-149.

Lin, K, & Lu, H. (2011). Why people use social networking sites: An empirical study integrating network externalities and motivation theory. *Computers in Human Behavior*, *27*(3), 1152-1161.

Lindsay, R. M., Lindsay, L. M., & Irvine, V. B. (1996). Instilling ethical behavior in organizations: A survey of Canadian companies. *Journal of Business Ethics*, *15*(4), 393-407.

Liu, C. C., Liang, T. P., Rajagopalan, B., & Sambamurthy, V. (2011). The crowding effect of rewards on knowledge-sharing behavior in virtual communities. In *Proceedings of the Pacific Asia Conference on Information Systems.*

Ma, M., & Agarwal, R. (2007). Through a glass darkly: Information technology design, identity verification, and knowledge contribution in online communities. *Information Systems Research*, *18*(1), 42-67.

Mann, J., Austin, T., Drakos, N., Rozwell, C., & Walls, A (2012). Predicts 2013: Social and collaboration go deeper and wider. *Gartner.* Retrieved from https://www.gartner.com/doc/2254316/predicts--socialcollaboration-deeper

Markus, M. L., Manville, B., & Agres, C. E. (2000). What makes a virtual organization work? *Sloan Management Review*, *42*(1), 13-26.

Marsan, C. D. (2011). Private social networks playing Facebook role in more workplaces. *Network World.* Retrieved from http://www.networkworld.com/news/2011/102011-private-social-networks-252220.html

Maurer, T. J., & Tarulli, B. A. (1994). Investigation of perceived environment, perceived outcome, and person variables in relationship to voluntary development activity by employees. *Journal of Applied Psychology*, *79*(1), 3-14.

Marett, K., & Joshi, K. D. (2009). The decision to share information and rumors: Examining the role of motivation in an online discussion forum. *Communications of the Association for Information Systems*, *24*, 47-68.

Messmer, E. (2009). Lockheed Martin Gives homegrown social-networking platform a spin. *Networkworld.com*. Retrieved from http://www.networkworld.com/news/2009/031109-infosec-lockheed-martin-social-networking.html

Mettler, T., & Winter, R. (2015). Are business users social? A design experiment exploring information sharing in enterprise social systems. *Journal of Information Technology*, *31*(2), 101-114.

Milton, N. (2014). Why does knowledge management fail (and how to avoid this happening). *Knoco stories.* Retrieved from http://www.nickmilton.com/search/label/failure%20story

Mook, D. G. (1983). In defense of external invalidity. *American Psychologist*, *38*(4), 379-387.

Neter, J., Wasserman, W., & Kutner, M. H. (1989). *Applied regression models*. Homewood, IL: Irwin.

Northcraft, G. B., Schmidt, A. M., & Ashford, S. J. (2011). Feedback and the rationing of time and effort among competing tasks. *Journal of Applied Psychology*, *96*(5), 1076-1086.

Osterloh, M., & Frey, B. S. (2000). Motivation, knowledge transfer, and organizational forms. *Organization Science, 11*(5), 538-550.

Papadimitriou, P., & Garcia-Molina, H. (2011). Data leakage detection. *IEEE Transactions on Knowledge and Data Engineering*, *23*(1), 51-63.

Pawlowski, J. M., Bick, M., Martensen, M., Peinl, R., Thalmann, S., Maier, R., Kruse, P., Hetmank, L., & Pirkkalainen, H. (2014). Social knowledge environments. *Business & Information Systems Engineering*, *6*(2), 81-88.

Pew Research Center. (2017). *Social media fact sheet*. Retrieved from http://www.pewinternet.org/fact-sheet/social-media/

Phang, C. W., Kankanhalli, A., Sabherwal, R. (2009). Usability and sociability in online communities: A comparative study of knowledge seeking and contribution. *Journal of the Association for Information Systems, 10*(10), 721-747.

Preece, J. (2000). *Online communities designing usability and supporting sociability*. West Sussex, England: John Wiley and Sons.

Preece, J. (2001). Sociability and usability in online communities: Determining and measuring success. *Behavior & Information Technology*, *20*(5), 347-356.

Preece, J. (2004). Online communities: Researching sociability and usability in hard to reach populations. *Australasian Journal of Information Systems*, *11*(2), 146-152.

Raacke, J., & Raacke, J. (2008). MySpace and Facebook: Applying the uses and gratifications theory to exploring friend-networking sites. *CyberPsychology and Behavior*, *11*(2), 169-174.

Raths, D. (2015). Getting the most out of enterprise social networks. *KMWorld, 24*(6), 12-13.

Rheingold, H. (1993) *The virtual community: Homesteading on the electronic frontier*. Reading, MA: Addison Wesley.

Rheingold, H. (2003). Howard Rheingold on collective action, social networks and smart mobs. *CIO.com*, Retrieved from http://www.cio.com/article/29804/Howard_Rheingold_onCollective_Action_Social_Networks_and_Smart_Mobs

Ryan, R. M., & Deci, E. L. (2000a). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68-78.

Ryan, R. M., & Deci, E. L. (2000b). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54-67.

Schmidt, A., & DeShon, R. (2007). What to do? The effects of discrepencies, incentives, and time on dynamic goal prioritization. *Journal of Applied Psychology, 9*2(4), 928-941.

Schmidt, A., & Dolis, C. (2009). Something's got to give: The effects of dual-goal difficulty, goal progress, and expectancies on resource allocation. *Journal of Applied Psychology, 94*(3), 678-691.

Schmidt, A. M., Dolis, C. M., & Tolli, A. P. (2009). A matter of time: Individual differences, contextual dynamics, and goal progress effects on multiple-goal self-regulation. *Journal of Applied Psychology*, *94*(3), 692-709.

Sears, D. O. (1986). College sophomores in the laboratory: Influences of a narrow data base on social psychology's view of human nature. *Journal of Personality and Social Psychology*, *51*(3), 515-530.

Selnow, G. W., & Gilbert, R. R. (1997). Charge managers with inspiring loyalty. *Workforce*, *76*(10), 85-87.

Siponen, M., Willison, R., & Baskerville, R. (2008). Power and practice in information systems security research. In *Proceedings of the International Conference on Information Systems.*

Son, L., & Metcalfe, J. (2000). Metacognitive and control strategies in study-time allocation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *26*(1), 204-221.

Stajkovic, A. D., & Luthans, F. (2001). Differential effects of incentive motivators on work performance. *Academy of Management Journal*, *44*(3), 580-590.

Straub, D. W. (1990). Effective IS security: An empirical study. *Information Systems Research*, *1*(3), 255-276.

Subrahmanyam, K., Reich, S. M., Waechter, N., & Espinoza, G. (2008). Online and offline social networks: Use of social networking sites by emerging adults. *Journal of Applied Developmental Psychology*, *29*(6), 420-433.

Tenbrunsel, A., & Messick, D. (1999). Sanctioning systems, decision frames, and cooperation. *Administrative Science Quarterly, 44*(4), 684-707.

Vodanovich, S., Sundaram, D, & Myers, M. (2010). Digital natives and ubiquitous information systems. *Information Systems Research*, *21*(4), 711-723.

Vuori, V., & Okkonen, J. (2012). Knowledge sharing motivational factors of using an intra-organizational social media platform. *Journal of Knowledge Management*, *16*(4), 592-603.

Wagner, D., Vollmar, G., & Wagner, H. T. (2014). The impact of information technology on knowledge creation: An affordance approach to social media. *Journal of Enterprise Information Management*, *27*(1), 31-44.

Wasko, M., & Faraj, S. (2000). It is what one does: Why people participate and help others in electronic communities of practice. *Journal of Strategic Information Systems*, *9*(2-3), 155-173.

Appendix A: Sequence of Pages as Seen During Experiment

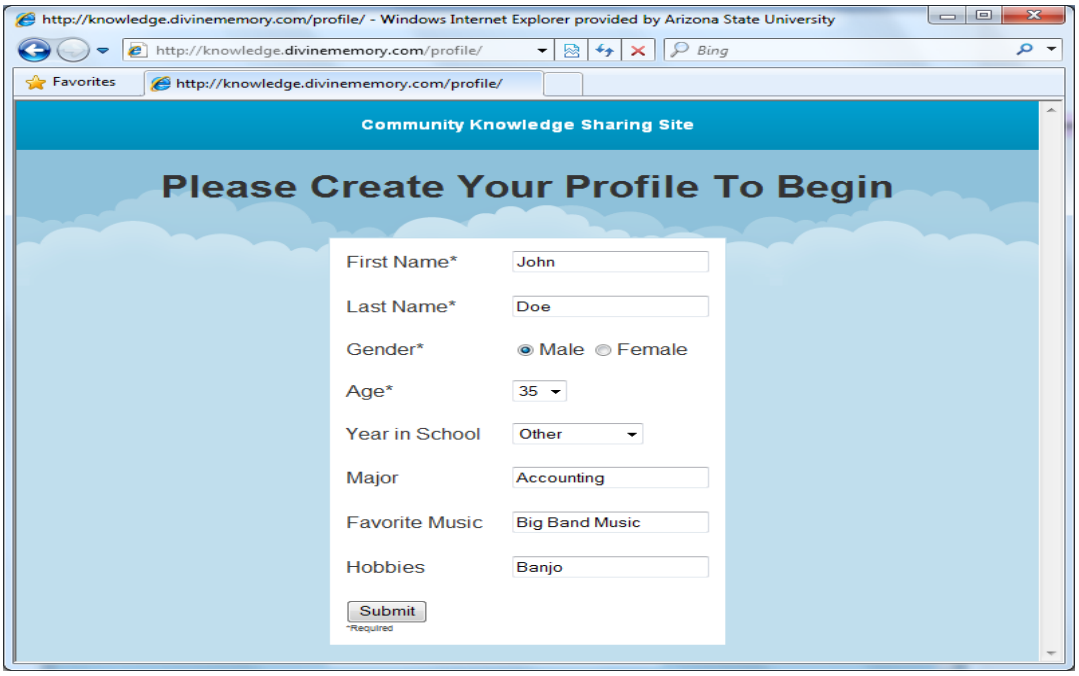


Figure A3. Community Profile Creation Page

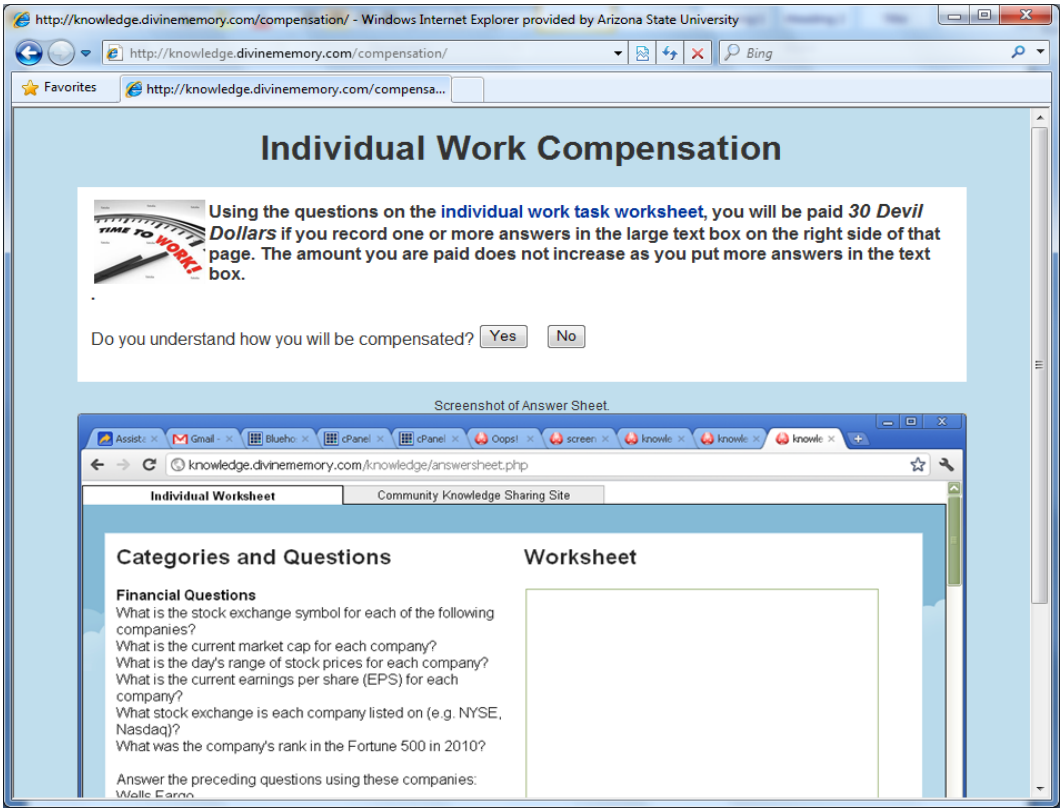


Figure A2. Randomly Presented Treatment for Primary Work Task

Figure A3. Randomly Presented Treatment for Knowledge Sharing Task

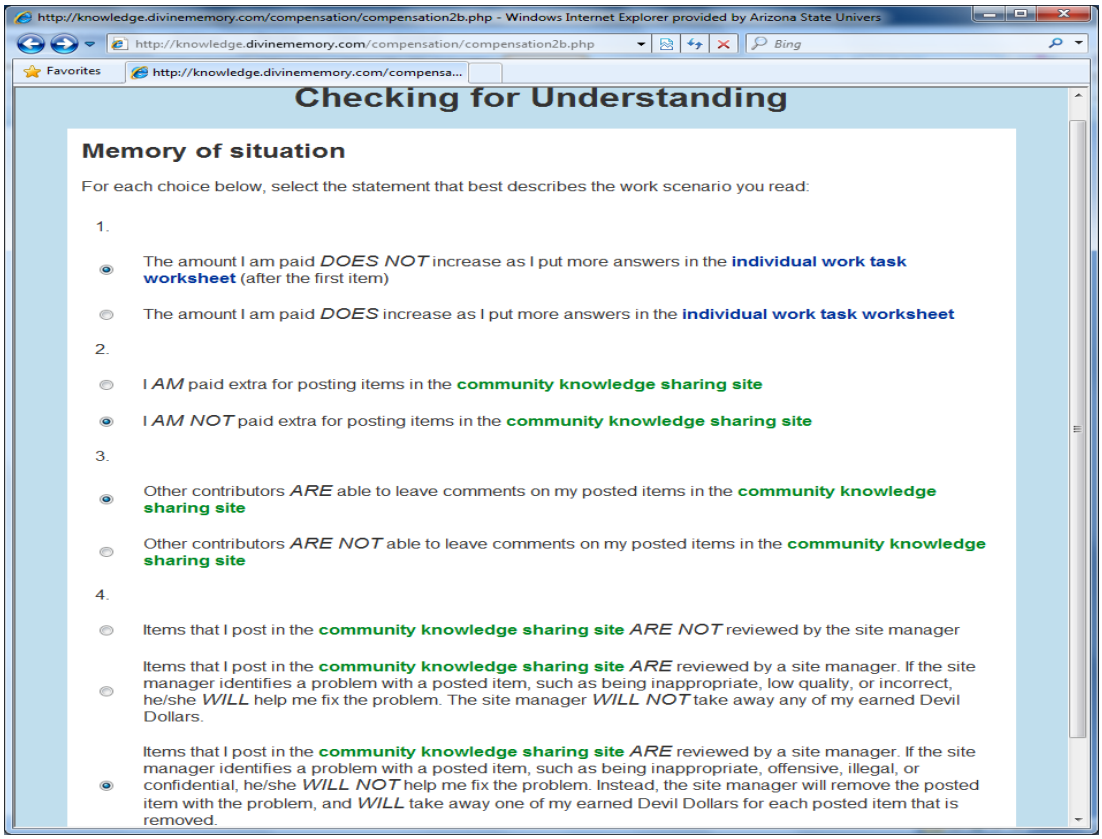


Figure A4. Treatment Recall Check Given Before Being Allowed to Begin Tasks

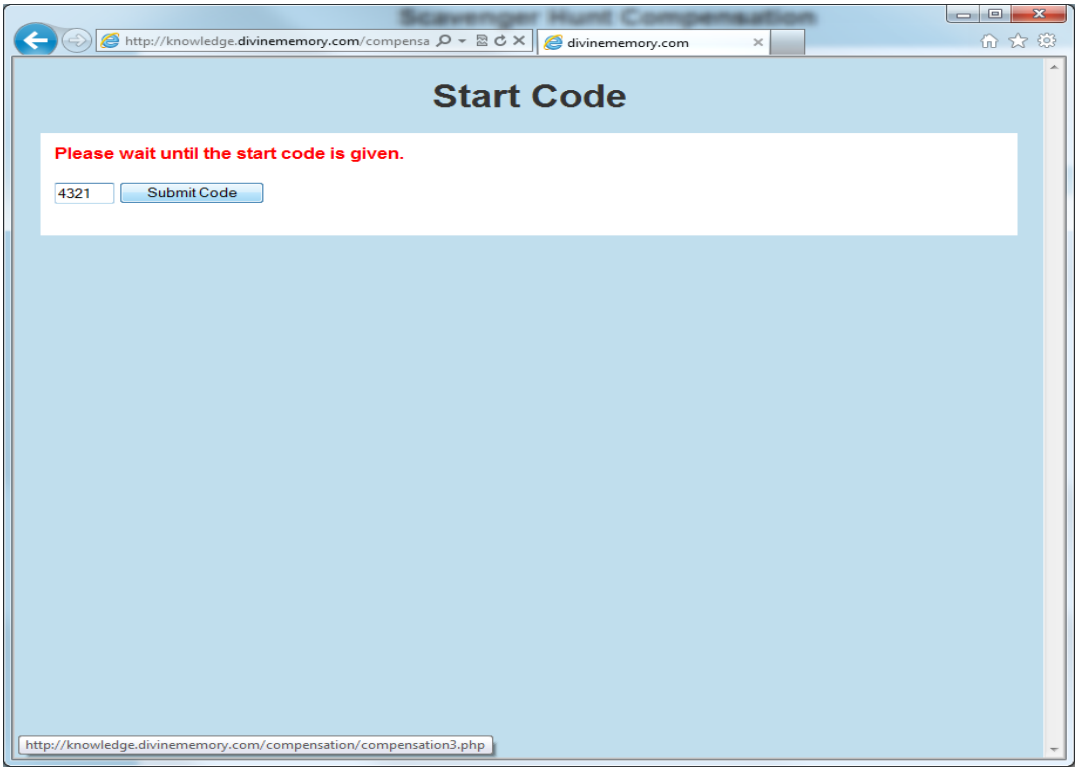


Figure A5. Page that all Participants Wait at Until Everyone Has Passed Treatment Recall Check

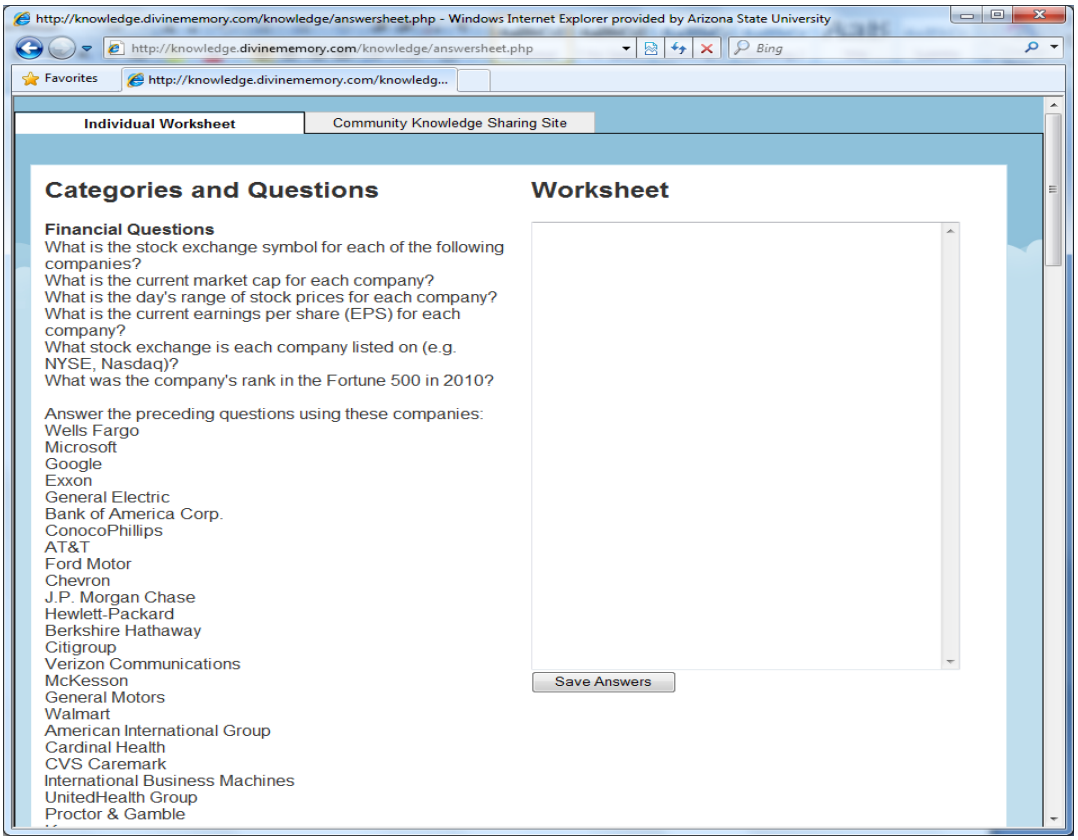


Figure A6. Primary Work Task Page

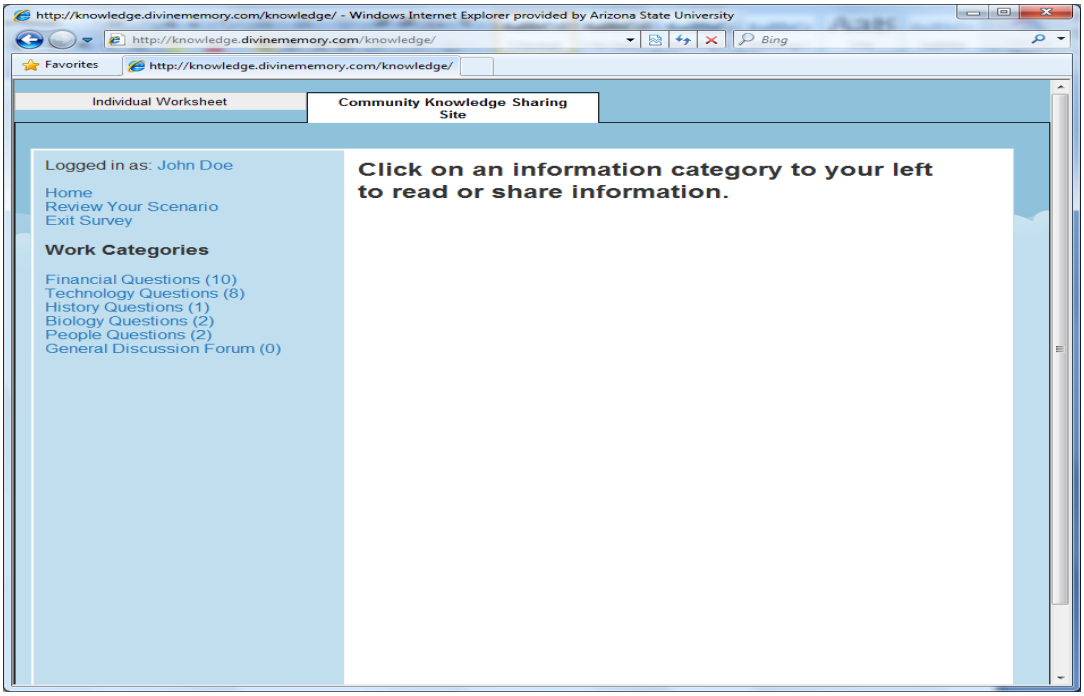


Figure A7. Knowledge-sharing Website

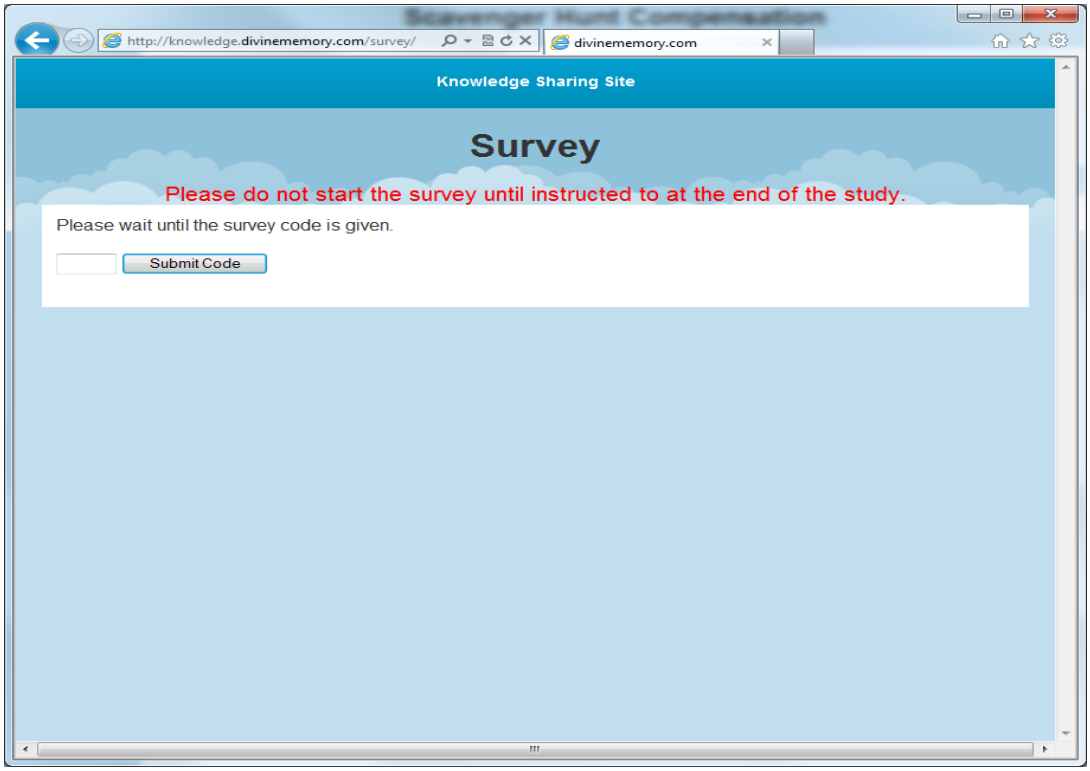


Figure A8. Page that all Participants Wait at Until Everyone Has Clicked on the Exit Survey Link

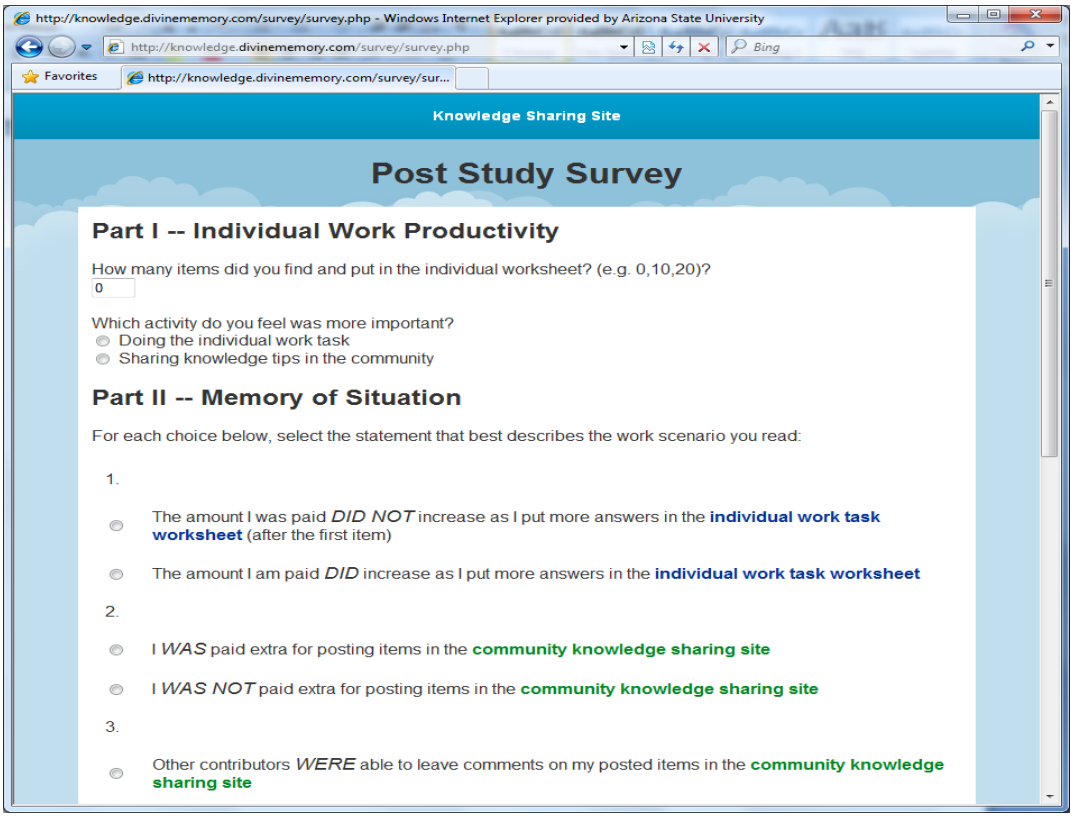


Figure A9. Post Experiment Survey

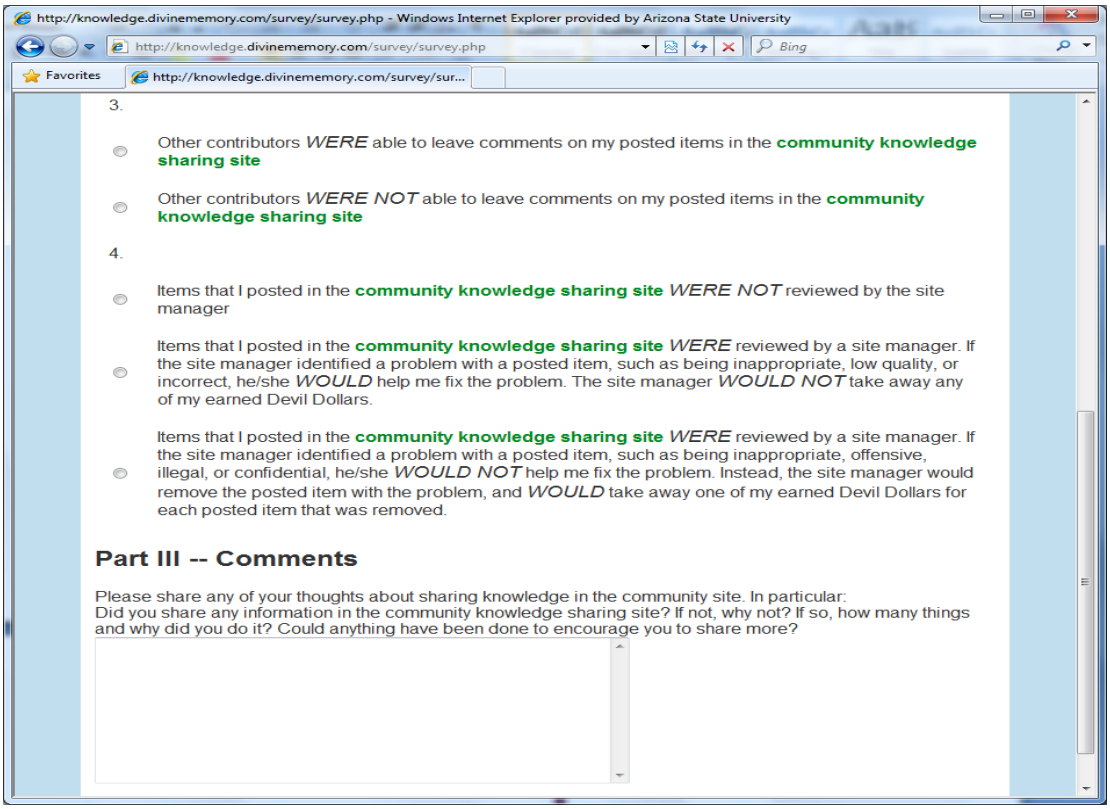


Figure A10. Post Experiment Survey Continued

Appendix B: Experimental Script

"Today I am conducting a voluntary study to learn more about knowledge sharing in business. The study asks you to do an online individual work task for 20 minutes and to record some of what you learn. In this study you earn 'devil dollars', which are similar to monopoly dollars, they aren't redeemable for anything in the real world but they make the situation competitive so we can see who earns the most."

[Show screenshot of primary work task screen to participants]

"You will go to a website and do an online information search with 5 different categories of questions. An example of a question is 'What is Exxon's Stock exchange symbol?" Do as many questions as you want, in any order. After 20 minutes I'll ask you to write down how many you did."

[Show screenshot of community knowledge sharing site to participants]

"If you use the community knowledge sharing site link, you can collaborate with others to help you do your work. You can write down anything on this site, ranging from urls to answers to questions. Collaborate as much or as little as you want to. Let me demonstrate."

[Demonstrate the following steps]

"You will fill out a profile for the community site" [Fill in John, Doe, 36, Male, Information Systems].

"You will read compensation information about the individual work task." [go to next page]

"You will read a situation about the community knowledge sharing website." [go to next page]

"You will get a quiz to see if you remember the compensation and situation information you just read. If you don't, you'll have to read that information again" [go to next page]

"Here is the individual work task you will be doing. On the left is a list of categories: Financial Questions, Technology Questions, History Questions, Biology Questions, People Questions." [scroll page and point out category headings].

"Under Financial Questions I see the question: What is the stock exchange symbol for each of the following companies? If I select Exxon from this list, and type into a search engine 'Exxon stock exchange symbol'[do task on google] , I see one place this answer is at is answers.com. I go there and see the answer is XOM. I write in my Worksheet 'Exxon is XOM'. [do task.] Any questions about the individual work task?"

"I may think that I now know something that will help others. I can click on the link for the community knowledge sharing site [point and click]. I see Financial Questions is a category. I click on it. I make a make a post to the community [post is 'Title for your contribution', 'Contribution in the form of an answer to a question or the source for an answer']. You can type in answers or sources of answers, whatever you think will help others. Any questions about the community knowledge sharing site? [take any questions]. Also, I can click on the link of the person's name who submitted this brilliant post and see their profile [clicks]."

"Please create a profile at knowledge.divinememory.com, read the instructions, and then wait for me to give you a code to start."

[Wait for everyone to pass check]

[Click Timer Start in knowledge.divinememory.com/dadmin]

[Show start code on screen]

"You have 20 minutes to spend your time however you like on the individual work task and the community knowledge sharing site. This is the start code, 4321."

[When 20 minutes are up]

"Time is up. Please count how many individual work items you completed" [30 seconds wait]. Ask "Does everyone have a count of their work items? Click on the community site link, then click on the exit survey link in the navigation bar."

[Show survey code on screen]

[When surveys are completed, read debriefing script]

"Thank you for participating in this study. The motivation behind this study is that organizations are interested in why some employees share knowledge in their private social networking websites and why some don't. Two examples of these are Cisco and Deloitte, who have huge communities for their organizations, but some groups of employees don't seem to share information about their jobs.

The task you performed was of secondary interest to the level of knowledge sharing that you did in the community. In this study, each of you read scenarios that described different types of pay, social website features, and the possibility of having your content monitored by a human being. At this point I will disclose two items that you were not informed of at the beginning. The first is that the postings you saw showing up in the community forum were not entered by students but rather by the computer, that way the amount of knowledge entered in was limited to a small quantity and you wouldn't feel that all of the useful information had already been posted. The other item to disclose is that, although the written scenario said that a human being would review your contributions for quality, that was not the case. The reason for saying this was to determine if an awareness of the potential review of your knowledge contributions by a manager would affect the likelihood of sharing knowledge. This is question important to business research. Are there any questions I can answer at this time about anything related to the study?"

Appendix C: Treatment Levels and Wording

During the experiment, we asked the participants to view a webpage (the treatment page) that explained the compensation and rules for study participation. The experimental subject would randomly see one of 24 combinations of written scenarios. We created those combinations as follows: one combination of financial incentives (4 levels), one type of human control (3 levels), and one type of social incentive (2 levels). We presented these levels to the subjects as follows:

Compensation treatment level 1: salaried with no financial incentive for knowledge sharing: "Using the questions on the individual work task worksheet, you will be paid 30 Devil Dollars if you record one or more answers in the large text box on the right side of that page. The amount you are paid does not increase as you put more answers in the text box."

"You are encouraged to post items for others in the community knowledge sharing site, but you WILL NOT be paid extra for it."

Compensation treatment level 2 (salaried plus financial incentive for knowledge sharing): "Using the questions on the individual work task worksheet, you will be paid 30 Devil Dollars if you record one or more answers in the large text box on the right side of that page. The amount you are paid does not increase as you put more answers in the text box."

"You are encouraged to post items for others in the community knowledge sharing site, and you WILL be paid an extra 0.25 Devil Dollars (25 cents) if you post one or more items in the community knowledge sharing site. This amount does not increase as you post more items in the community site."

Compensation treatment level 3 (piece-rate with no financial incentive for knowledge sharing): "Using the questions on the individual work task worksheet, you will be paid one Devil Dollar for each answer to a question that you record in the large text box on the right side of that page."

"You are encouraged to post items for others in the community knowledge sharing site, but you WILL NOT be paid extra for it."

Compensation treatment level 4 (piece-rate plus financial incentive for knowledge sharing): "Using the questions on the individual work task worksheet, you will be paid one Devil Dollar for each answer to a question that you record in the large text box on the right side of that page."

"You are encouraged to post items for others in the community knowledge sharing site, and you WILL be paid an extra 0.01 Devil Dollars (one cent) for each item you post in the community knowledge sharing site."

Social features treatment level 1 (none): "Other contributors ARE NOT able to leave comments on your posted items in the community knowledge sharing site. If you post an item there, other contributors WILL NOT be able to comment on it."

Social features treatment level 2 (social features present): "Other contributors ARE able to leave comments on your posted items in the community knowledge sharing site. If you post an item there, other contributors WILL be able to comment on it."

Subjects receiving the social features treatment level 2 saw commenting enabled and page view counts visible in the community website. At 5, 10, and 15 minutes, the following activity happened in the knowledge sharing website:

1. Page view counts that are next to knowledge postings made by the subject (if any) were increased by 15 views (making it appear that others were looking at their posts).
2. The most recent contribution they had made (if any) got a positive written comment such as "Thanks, that was helpful" at the 5 minute mark, "You post good information" at the 10 minute mark, and "You're better at this than I am" at the 15 minute mark." Human Control Treatment Level 1 (none): "Items that contributors post in the community knowledge sharing site ARE NOT reviewed by the site manager."

Human control treatment level 2 (supportive moderator): "Items that contributors post in the community knowledge sharing site ARE reviewed by the site manager. If the site manager identifies a problem with a posted item, such as being inappropriate, low quality, or incorrect, he/she WILL help you fix the problem. The site manager WILL NOT take away any of your earned Devil Dollars."

Human control treatment level 3 (policing moderator): “Items that contributors post in the community knowledge sharing site ARE reviewed by the site manager. If the site manager identifies a problem with a posted item, such as being inappropriate, offensive, illegal, or confidential, he/she WILL NOT help you fix the problem. Instead, the site manager will remove the posted item with the problem, and WILL take away one of your earned Devil Dollars for each posted item that is removed.”

Appendix D: Treatment Levels and Wording

"For each choice below, select the statement that best describes the work scenario you read:"

Manipulation checks for financial incentives:

- The amount I am paid DOES NOT increase as I put more answers in the individual work task worksheet (after the first item)
- The amount I am paid DOES increase as I put more answers in the individual work task worksheet
- I AM paid extra for posting items in the community knowledge sharing site
- I AM NOT paid extra for posting items in the community knowledge sharing site

Manipulation check for social incentives:

- Other contributors ARE able to leave comments on my posted items in the community knowledge sharing site
- Other contributors ARE NOT able to leave comments on my posted items in the community knowledge sharing site

Manipulation check for human moderator:

- Items that I post in the community knowledge sharing site ARE NOT reviewed by the site manager.
- Items that I post in the community knowledge sharing site ARE reviewed by a site manager. If the site manager identifies a problem with a posted item, such as being inappropriate, low quality, or incorrect, he/she WILL help me fix the problem. The site manager WILL NOT take away any of my earned Devil Dollars.
- Items that I post in the community knowledge sharing site ARE reviewed by a site manager. If the site manager identifies a problem with a posted item, such as being inappropriate, offensive, illegal, or confidential, he/she WILL NOT help me fix the problem. Instead, the site manager will remove the posted item with the problem, and WILL take away one of my earned Devil Dollars for each posted item that is removed.

About the Authors

Degan Kettles is an Associate Teaching Professor in the Department of Information Systems in the Marriott School at Brigham Young University. He received his PhD from Arizona State University and previously taught at the University of Central Oklahoma. His research areas include the use of enterprise social media for knowledge management, electronic commerce, and business analytics.

Paul John Steinbart is a Professor in the Department of Information Systems in the W. P. Carey School of Business at Arizona State University. He earned his PhD at Michigan State University. His research interests include information security and privacy. His research has been published in *MIS Quarterly*, *Information Systems Research*, *Journal of the Association for Information Systems*, *Decision Sciences*, and *The Accounting Review*.

Robert D. St. Louis is a Professor of Information Systems at Arizona State University. He received his AB degree from Rockhurst College, and his MS and Ph.D. degrees from Purdue University. He began teaching at ASU in 1969, but spent the period from 1976 through 1981 working full time as a researcher for state and federal agencies. He teaches classes on information management and business analytics; and conducts research in the areas of document search, enterprise performance management systems, and self-service business analytics.