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Motivation and knowledge sharing: a meta-analysis of main and moderating effects

Tuyet-Mai Nguyen, Tuan Phong Nham, Fabian Jintae Froese and Ashish Malik

Abstract

Purpose – *The purpose of this study is to investigate the effects of intrinsic and extrinsic motivation on knowledge sharing and the moderating effects of individual demographics, organizational context and cultural context in that relationship.*

Design/methodology/approach – *This study conducted a meta-analysis of 44 studies involving 14,023 participants to examine the direct and moderating effects of motivation on knowledge sharing.*

Findings – *Results revealed that both extrinsic and intrinsic motivational factors were associated with higher levels of knowledge sharing, while the effect was stronger for intrinsic motivation. Moreover, results revealed that substantial variance was explained by moderating variables. Further investigation revealed that individual characteristics (age, gender), organizational context (organizational setting vs. open system, IT infrastructure) and cultural context (collectivism, uncertainty avoidance, performance orientation, power distance) moderated the motivation and knowledge sharing relationship.*

Research limitations/implications – *As a meta-analysis, this study is confined to variables that have been frequently analyzed in prior research. Future research could further increase our understanding of different types of knowledge sharing and various boundary conditions.*

Practical implications – *Organizations should provide customized incentive systems to specific target groups to align motivation and knowledge sharing. Multinational organizations may consider different motivation schemes across countries to better suit cultural differences.*

Originality/value – *Despite a growing number of studies highlighting the important role of motivation in predicting knowledge sharing, the evidence is mixed. Based on a meta-analysis, this study identified true relationships and identified moderating effects that help explain prior mixed results.*

Keywords *Motivation, Meta-analysis, Knowledge sharing, Intrinsic and extrinsic motivators, Individual-level, Organisational-level*

Paper type *Research paper*

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1. Introduction

In the knowledge-based view of a firm, knowledge has been identified as the most strategically important resource and a principal source of value creation (Teece and Al-Aali, 2011). Valuable knowledge resides in people, and people can share knowledge to transfer it to different individuals and groups, and from one generation to another. A large body of literature has investigated the antecedents of knowledge sharing behavior to encourage individuals to participate in the knowledge sharing process (Kumari and Takahashi, 2014; Nguyen *et al.*, 2019; Witherspoon *et al.*, 2013). Prior research concluded that an individual's motivation plays a key role in enabling knowledge sharing (Kankanhalli *et al.*, 2005; Osterloh and Frey, 2000; Wasko and Faraj, 2005).

Although prior research generally agrees on the importance of motivation in predicting knowledge sharing, the findings have been inconsistent. For example, Zhao *et al.* (2016)

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found a small correlation ($r = 0.10$) between self-enjoyment (an intrinsic motivator) and knowledge sharing, whereas [Chung et al. \(2016\)](#) reported a strong association ($r = 0.66$). Conflicting results are also evident in research by [Quigley et al. \(2007\)](#), which found a negative correlation ($r = -0.33$) between rewards (extrinsic motivator) and knowledge sharing, whereas [Pee et al. \(2010\)](#) found a strong positive relationship ($r = 0.61$). Thus, we still do not know about the true relationship between motivation and knowledge sharing. Prior research suggests that individual and organizational contextual factors can explain the conflicting results ([Witherspoon et al., 2013](#)), yet comprehensive empirical evidence is missing. Another possible explanation for the inconsistent findings is the fragmented nature of most prior research, which often investigated only single motivation factors but ignored other important motivation factors. A more comprehensive, simultaneous analysis would provide further insights. Thus, the purpose of this study is to examine the effects of a comprehensive set of motivational factors on knowledge sharing and potential individual and contextual moderating effects.

This study intends to make the following contributions. First, by conducting a meta-analysis over a large number of studies and individuals, this study contributes to an increased understanding of the true relationship between motivation and knowledge sharing. Results provide important implications for both theory and practice. From a theoretical point of view, our meta-analysis will bring clarity to previously mixed findings ([Chung et al., 2016](#); [Pee et al., 2010](#); [Quigley et al., 2007](#); [Zhao et al., 2016](#)). From a managerial point of view, our results provide the basis for organizations on how to design human resource management practices to better motivate employees to share knowledge ([Malik et al., 2019](#)). Second, this meta-analysis extends prior research ([Nguyen et al., 2019](#); [Witherspoon et al., 2013](#)), by providing a dedicated and up-to-date analysis of motivation and its boundary conditions on knowledge sharing behavior. Our systematic investigation of individual, organizational and cultural moderating effects contributes to an understanding of why prior results differed. Third, responding to [Law et al.'s \(2017\)](#) critique, this study empirically investigates the effects of intrinsic and extrinsic motivation simultaneously and tests for the interaction effects of both motivations on knowledge sharing.

2. Theory and hypotheses

Motivation has been considered a key determinant of knowledge sharing ([Osterloh and Frey, 2000](#)). In other words, motivation is the force that shapes the desires of individuals to share knowledge ([Tang et al., 2016](#)). Knowledge sharing motivation is usually divided into two categories, extrinsic and intrinsic ([Abuhamdeh and Csikszentmihalyi, 2009](#); [Amabile, 1993](#); [Gong et al., 2017](#); [Malka and Chatman, 2003](#)). Extrinsic motivation comes from some expected consequences or a goal-driven reason when performing an activity ([Osterloh and Frey, 2000](#)). Intrinsic motivation in knowledge sharing, on the other hand, implies that individuals find the activity in and of itself interesting, enjoyable, effective and stimulating ([Foss et al., 2009](#)).

2.1 Effects of motivation on knowledge sharing

Extrinsic motivation to share knowledge is an outcome belief based on a cost–benefit analysis ([Osterloh and Frey, 2000](#)). This means the knowledge sharing process will occur when the perceived benefits equal or exceed the costs ([Kelly and Thibaut, 1978](#)). The salient perceived benefits validated in knowledge sharing are rewards and reciprocity ([Ko et al., 2005](#); [Lin, 2007](#)). From a socioeconomic perspective, individuals engage in behavior, which satisfies their best interests. In the context of knowledge sharing, people are more willing to take part in knowledge sharing activities if some tangible rewards are expected. Tangible rewards are extrinsic motivators that help individuals to satisfy their needs. [Bock et al. \(2005\)](#) argue that it is unrealistic to assume that employees automatically share knowledge without strong rewarding incentives. Moreover, they conclude that the success or failure of knowledge management depends on whether organizations offer tangible

rewards to their employees. In response, even non-commercial virtual communities pay rewards, in terms of virtual currencies, to motivate members to share knowledge (Liao *et al.*, 2013).

The other main component of extrinsic motivation, reciprocity, refers to the expectation of rewarding actions. Because individuals collect valuable knowledge from other individuals, i.e. knowledge donators, they are indebted to transfer equivalent knowledge back to knowledge donators (Schulz, 2001). This implies that knowledge donators expect their knowledge sharing to prove worthwhile via the mutual give and take of knowledge. Such reciprocity has been proven to be a major enabler of knowledge sharing (Chang and Chuang, 2011; Lin, 2007). The reciprocal knowledge exchange relationship encourages knowledge sharing behavior, and as a result, individuals may be more willing to share their valuable knowledge (Wasko and Faraj, 2005; Lin, 2007). Therefore, we hypothesize that:

H1. Extrinsic motivation, in terms of (a) tangible rewards and (b) reciprocity, is positively related to knowledge sharing.

Intrinsic motivation develops at an early stage in life. People are active and curious to learn and explore without requiring extrinsic incentives to do so. Highly valued behavioral outcomes such as personal growth, creativity and quality of learning are significantly enhanced by intrinsically motivated individuals (Vansteenkiste *et al.*, 2004). Building on prior studies in the knowledge sharing context (Kwahk and Park, 2016; Suppiah and Sandhu, 2011), this study focuses on perceived self-efficacy and perceived self-enjoyment as two salient intrinsic motivators in the knowledge sharing context.

From an intrinsic motivational perspective, individual behavior is evoked by the belief in having the capability to complete tasks (Lai and Chen, 2014). Knowledge self-efficacy is intrinsic motivation in knowledge sharing, which derives from empowering individuals with a certain level of freedom, independence, discretion and autonomy in their activities (Lai and Chen, 2014). If individuals have the sense of knowledge self-efficacy, they tend to be willing to share their knowledge, leading to sharing behavior (Kankanhalli *et al.*, 2005).

Perceived self-enjoyment stems from the concept of altruism in which people help others without expecting anything in return (Krebs, 1975). Individuals have a greater tendency to share knowledge owing to their desire to help others (Wasko and Faraj, 2005). By sharing knowledge to help others, donators can gain satisfaction derived from intrinsic enjoyment (Wasko and Faraj, 2005). Perceived self-enjoyment is an intrinsic motivation, which makes individuals view sharing knowledge to help others more favorably and leads to sharing behavior (Wasko and Faraj, 2005). Therefore, we hypothesize that:

H2. Intrinsic motivation, in terms of (a) self-efficacy and (b) self-enjoyment, is positively related to knowledge sharing.

Building on prior research, we argue that intrinsic motivation has a stronger effect on knowledge sharing than extrinsic motivation. A study by Cho *et al.* (2015) showed that the effect of intrinsic motivation on knowledge sharing was almost double that of extrinsic motivation. Pee and Lee (2015) also confirmed that intrinsic motivation had a stronger, more stable and more sustainable influence. They reasoned that because extrinsic motivation originates from a promise of a reward or threat of punishment, it only makes individuals share the minimum necessary. In contrast, intrinsic motivation stems from inherent desire, leading to a more enduring behavior. These arguments were supported by other scholars (Foss *et al.*, 2009; Hau *et al.*, 2013; Hung *et al.*, 2011; Lin, 2007). Thus, in line with prior research, we propose the following hypothesis:

H3. Intrinsic motivation has a stronger effect on knowledge sharing than extrinsic motivation.

Intrinsic motivation and extrinsic motivation often coexist; thus, there is a possible interaction between these two kinds of motivation (Gong *et al.*, 2017). We argue that

extrinsic motivation can strengthen the relationship between intrinsic motivation and knowledge sharing behavior. Intrinsically motivated individuals may not only pursue an intrinsic desire for their self-efficacy and self-enjoyment for helping others but also gain rewards and reciprocity (Abuhamdeh and Csikszentmihalyi, 2009). Furthermore, whereas intrinsic motivation tends to make individuals view knowledge sharing as an end in itself and enjoy the process, extrinsic motivation is likely to direct individuals to view knowledge sharing as a means to an end (Amabile, 1993; Malka and Chatman, 2003; Abuhamdeh and Csikszentmihalyi, 2009). Thus, extrinsic motivation can amplify the relationship between intrinsic motivation and knowledge sharing behavior because of greater alignment of the process and outcome (Abuhamdeh and Csikszentmihalyi, 2009; Amabile, 1993). This leads to the following hypothesis:

- H4.* Extrinsic motivation moderates the relationship between intrinsic motivation and knowledge sharing in that the positive relationship is stronger when the extrinsic motivation is higher.

2.2 Moderators of the motivation–knowledge sharing relationships

To resolve inconsistent findings in prior research, we investigate the moderating roles of individual characteristics, organizational contexts and cultural contexts in the motivation and knowledge sharing relationship. We will first start with individual characteristics that could moderate the relation between motivation and knowledge sharing. Drawing on prior related research, it is plausible to expect that the relationship might differ depending on age and gender of individuals. Age is likely to moderate the relationships between motivation and knowledge sharing behavior. Younger individuals tend to consider knowledge sharing as an avenue to express themselves and get recognition from others, thus they are more influenced by motivational factors to share knowledge (El Badawy and Magdy, 2015). In contrast, older individuals, who often hold a fear of losing competitive advantages, react less to motivational factors to share knowledge (Walsh *et al.*, 2008).

Regarding gender, we argue that women are more sensitive to motivation to share knowledge than men, because women and men respond differently to external stimuli (Lin, 2008). In a related study, Lin (2008) found that altruism had a stronger effect on knowledge sharing behavior, because women tend to have more communal attributes. In another study, gender was found to moderate the relationship between employees' perceptions toward knowledge sharing, such that, relative to men, women need a stronger positive social interaction culture before they would engage in knowledge sharing (Connelly and Kelloway, 2003). Consistent with the above theorizing, we propose the following hypotheses:

- H5.* Individual demographics moderate the relationship between motivation and knowledge sharing.
- H5a.* Age moderates the relationship between motivation and knowledge sharing in that the effects of motivational factors are stronger for younger participants.
- H5b.* Gender moderates the relationship between motivation and knowledge sharing in that the effects of motivational factors are stronger for women.

The organizational context is likely to moderate the relationship between motivation and knowledge sharing. Prior research often investigated knowledge sharing either in an organizational setting (also referred to as a closed system) or in an open system (Liebowitz and Yan, 2004). Whereas in an organizational setting, only employees can join (Koulikov, 2011), an open system refers to a place that is open for anyone to join and share knowledge such as online communities (Preece and Maloney-Krichmar, 2005). We argue that motivational factors will be more effective in eliciting knowledge sharing in organizational settings compared with open systems. In organizational settings, individuals belong to the same organization, have relationships with co-workers and are encouraged to share

knowledge (Koulikov, 2011; Preece and Maloney-Krichmar, 2005). Thus, individuals are likely to react more strongly to motivational factors to perform knowledge sharing behavior because that would elicit feelings of contributing to their organizations and helping co-workers. In contrast, in open systems, individuals are often free from organizational and relational responsibilities, thus reducing the influence of motivation on knowledge sharing (Jin *et al.*, 2010).

We argue that information technology (IT) infrastructure, referring to the use of IT in the knowledge sharing process, e.g. online forums and blogs, can exert a moderating role between motivation and knowledge sharing. IT infrastructure simplifies knowledge sharing. If IT infrastructure exists, individuals can share knowledge easier and faster without time and location restriction (Charband and Navimipour, 2016; Shen *et al.*, 2010). Thus, motivational factors can more easily translate into intended knowledge sharing. However, without IT infrastructure, even though individuals hold motivation, it is more difficult to share knowledge and they might be more hesitant to share knowledge (Davison *et al.*, 2013). A related study by Liang *et al.* (2008) showed that IT moderated the relationships between commitment, social interaction and trust and knowledge sharing. This leads to the following hypotheses:

- H6.* Organizational context moderates the relationship between motivation and knowledge sharing.
- H6a.* Organizational setting moderates the relationship between motivation and knowledge sharing in that the effects of motivational factors are stronger in organizational settings as compared with open systems.
- H6b.* IT infrastructure moderates the relationship between motivation and knowledge sharing in that the effects of motivational factors are stronger when IT infrastructure is provided.

In addition, we argue that cultural context acts as a moderator in the relationship between motivation and knowledge sharing behavior. Culture is likely to have an influence on knowledge sharing (Haasis *et al.*, 2018; Stoermer *et al.*, 2017; Wilkesmann *et al.*, 2009). Culture reflects the agreement of members in terms of values, history and language and is the perception of the human mind that distinguishes members of different groups (Hofstede, 1980). House *et al.* (2004) conducted a large-scale survey, the GLOBE study, of 17,000 managers across 62 national cultures to measure culture. Although the original GLOBE study consists of nine dimensions, Wilkesmann *et al.* (2009) found that only four dimensions were relevant in the knowledge sharing context: in-group collectivism, uncertainty avoidance, performance orientation and power distance. Building on Wilkesmann *et al.* (2009), we develop hypotheses for each of these four cultural dimensions.

In-group collectivism describes the tendency of people to put group goals before personal goals (Ardichvili *et al.*, 2006). Witherspoon *et al.* (2013) found in their qualitative study that the degree of collectivism may be a potential moderator in the knowledge sharing process because in collectivist cultures, individuals tend to place a higher priority on group benefits than individual interests and needs. Personal relationships are important in collectivistic countries such as China or Korea (Cho *et al.*, 2019; Li *et al.*, 2018). In higher in-group collectivistic cultures, individuals tend to be loyal to their group and they are likely to be motivated by activities that bring benefits for the group, including knowledge sharing (Wollan *et al.*, 2009). Thus, in a society with higher in-group collectivism, the influence of motivational factors on knowledge sharing behavior is expected to be stronger (Wilkesmann *et al.*, 2009).

Another cultural dimension is uncertainty avoidance, which refers to strict rules that help individuals to avoid unpredictable events. Higher uncertainty avoidance societies can facilitate the influence of motivation on knowledge sharing because clear rules and rights

can create a favorable environment for the knowledge sharing process (Javidan and House, 2001). In such environments, individuals may be more willing to share knowledge to help others and reduce uncertainty because helping by sharing knowledge can be regarded as enhancing the likelihood of decreasing additional negative outcomes. In such environments, extrinsic motivational factors are more likely to result in actual rewards, thus increasing the valence of such motivation factors and motivating individuals to engage in knowledge behavior.

The cultural dimension of performance orientation is concerned with the importance and willingness of individuals to achieve certain work goals (Javidan and House, 2001). In high performance-oriented societies, there is an increased emphasis on performance via sharing knowledge (Hofstede, 2001). Such societies strongly drive motivated individuals to share knowledge to improve performance outcomes (Wollan *et al.*, 2009). Therefore, the alignment between high performance-oriented contexts and motivation may enhance the knowledge sharing process (Wilkesmann *et al.*, 2009). Conversely, in the low performance-oriented societies, individuals do not have high performance pressures; therefore, individuals are likely to engage in knowledge sharing behavior, regardless of motivation factors (Wilkesmann *et al.*, 2009).

The last cultural dimension is power distance, referring to the unequal distribution of power (Carl *et al.*, 2004). In high power distance societies, individuals are inhibited by hierarchies (Cho *et al.*, 2019). In such societies, despite being motivated to share knowledge, individuals will be less likely to share knowledge to avoid potentially embarrassing situations in front of their bosses (Wilkesmann *et al.*, 2009). In contrast, in low power distance societies, individuals are not afraid of losing face in front of their bosses, and the more they are motivated the more they will share knowledge (Hofstede, 2001). Therefore, we hypothesize that:

- H7. Cultural context moderates the relationship between motivation and knowledge sharing.
- H7a. In-group collectivism moderates the relationship between motivation and knowledge sharing in that the effects of motivational factors are stronger in high in-group collectivistic cultures.
- H7b. Uncertainty avoidance moderates the relationship between motivation and knowledge sharing in that the effects of motivational factors are stronger in high uncertainty avoidance cultures.
- H7c. Performance orientation moderates the relationship between motivation and knowledge sharing in that the effects of motivational factors are stronger in high performance orientation cultures.
- H7d. Power distance moderates the relationship between motivation and knowledge sharing in that the effects of motivational factors are weaker in high power distance cultures.

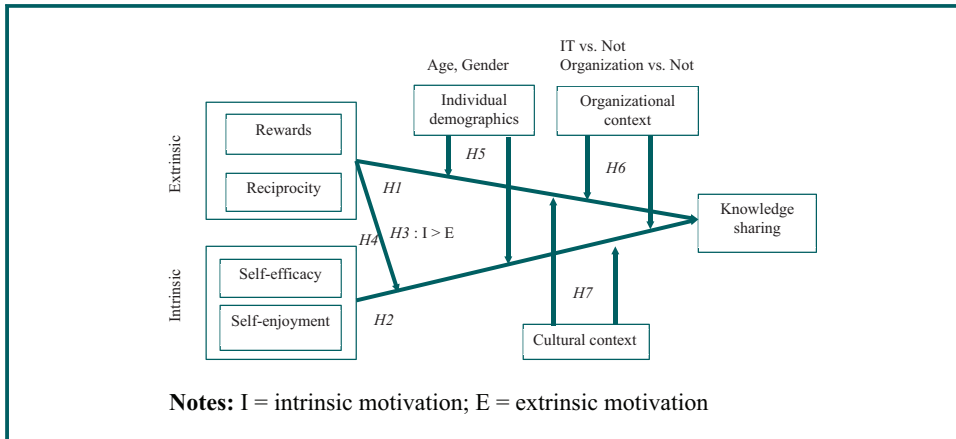
Figure 1 provides an overview of the expected relationships.

3. Methodology

3.1 Methodological approach

Meta-analysis as a reproducible, rigorous and comprehensive method is most appropriate for this study, as it combines and analyzes large data from prior studies. Thus, this method is effective when research designs of included studies, such as methodology or response variables, are comparable. Meta-analyses enables us to find true relationships between motivation and knowledge sharing based on prior studies.

Figure 1 Conceptual framework



3.2 Sample

The selection process was based on the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (Moher *et al.*, 2009). To identify relevant studies, we used five online academic sources: Google Scholar, ScienceDirect, Springerlink, Web of Science and IEEE. The keyword search terms included “knowledge shar*”, “information shar*” and “knowledge transfer*” from 2000 to 2017. We included published as well as working papers. Journal articles tend to publish statistically significant results, which can lead to inflated results. To reduce this bias, we also included working papers (Rothstein *et al.*, 2006). To be included in our meta-analysis, articles had to meet the following criteria:

- written in English;
- include correlation results;
- examined at least one of our hypothesized relationships; and
- if two or more studies relied on the same data, these were treated as one.

Our initial search revealed 12,423 papers. We carefully scanned these articles and dropped 12,379 articles because they did not fulfill our selection criteria, as explained above, resulting in a final sample of 44 papers for our meta-analysis.

3.3 Coding of variables

To ensure the reliability of our findings, two raters coded independently. One author and one research assistant, who was not involved with this study, independently coded the studies. The inter-rater reliability for the codes was 86.4 per cent, indicating a high level of agreement. All disagreements between the two raters were resolved by discussion until a consensus was reached. Sample sizes and correlation coefficients between dependent variable (knowledge sharing) and independent variables (self-efficacy, self-enjoyment, rewards and reciprocity) were collected and coded for each study. When a study measured two types or more of variables, we averaged correlation coefficients for the same relationship reported. We also coded the studies for several potential moderators to determine whether they explained variation in the effect sizes. The studies were grouped into subgroups based on individual characteristics, organizational contexts and cultural contexts. When information about a moderator in a study was not available, the variable was coded as “N/A” or not available and excluded from the analysis. For individual characteristics, we calculated age mean based on the average age and sample size of each study. Relying on the age mean, we coded age as younger and older groups. We

coded gender as more male group and more female group based on the comparison of the number of male and female participants in each study.

Regarding organizational contexts, we searched for the sample descriptions of each study to check whether knowledge was shared within a company and with the support of IT. This resulted in two codes distinguishing between organizational setting versus open systems and IT infrastructure versus non-IT infrastructure. In terms of cultural contexts, we collected the information of the country from which each sample was drawn. Then we assigned value to each study based on scores from House *et al.* (2004) for four cultural dimensions: in-group collectivism, uncertainty avoidance, performance orientation and power distance. Then we calculated the mean scores based on the assigned value and sample size of each study, and then used the mean scores to code as higher and lower subgroups. Samples that were collected from multiple countries were coded as “mixed” and were not used for the moderating analyses.

3.4 Statistical analyses

We conducted the meta-analysis procedures following the guidelines of Hunter *et al.* (1982). Accordingly, we used a fixed-effect model for the meta-analysis, similar to previous meta-analytical studies (Aguirre-Rodriguez *et al.*, 2012; Witherspoon *et al.*, 2013). Correlation coefficients were collected as the effect size metric. To obtain more accurate effect size estimates and to eliminate attenuation due to positive and negative sampling error (error because of observing a sample instead of the entire population), the sample-size weighted correlation r_U was calculated with the following formula:

$$r_U = \frac{\sum N_i r_i}{\sum N_i}$$

where N is the sample size in each study and r_i is the observed correlation in a specific study i . We also proceeded to detect outliers using graphical procedures to check the skewness of data. If an extreme value was found, analyses were conducted both including and excluding the outlier. The next step examined the statistical significance of corrected effect size; 95 per cent confidence intervals being calculated for each mean estimate using MetaWin Version 2 statistical software. Confidence intervals indicate the effect range in the true population; therefore, if confidence intervals did not contain zero, it meant that the correlation was significant.

3.4.1 File drawer bias results. To avoid the file drawer problem in which researchers tend to not submit papers with insignificant results (Rothstein *et al.*, 2006), as well as the robustness of the meta-analysis, the funnel plot statistics and the fail-safe N technique were calculated. The fail-safe N shows the numbers of studies that show the relationship to trivial results, and 0.5 was the set value, as suggested by Hunter *et al.* (1982). Fail-safe N was calculated only when funnel plot statistics (Kendall's Tau and Spearman rank-order correlation) were significant ($p < 0.05$). Then, the fail-safe number was compared with $5k + 1$ (k is the number of studies with a relationship between two variables).

3.4.2 Q-statistic: effect size variability across studies. The Q-statistic shows the heterogeneity between groups. It tests whether the effect sizes of different studies estimate the same population effect size. A significant Q-statistic indicates that there are probably opposing influences or a moderating effect on the dependent variable (Lipsey and Wilson, 2001).

3.4.3 Analysis of moderating effects. Three types of moderators were considered: individual characteristics, organizational contexts and cultural contexts. We only tested for possible moderating effects if the following conditions were met: The relationship between the two main variables had at least six studies ($k > 5$). At least two studies were on each side of a moderator. To investigate the moderating effect, the homogeneity estimate (Q value) for

each pairwise relationship was also calculated based on the [Hedges and Olkin \(1985\)](#) procedure.

4. Results

4.1 Descriptive statistics

Our meta-analysis is based on 44 studies. Among them, 21 were published between 2005 and 2010 and a further 23 published between 2010 and 2017. Fourteen countries or regions were included in the samples: Taiwan (15 studies), South Korea (7), the USA (7), Japan (3), Iran (3), China (2), Belgium (1), Canada (1), Srilanka (1), Singapore (1), Saudi Arabia (1), Pakistan (1), Malaysia (1) and Germany (1). One study sampled participants from several locations. In terms of publication outlets, 19 papers (43.2 per cent) were published in business outlets, six papers (13.6 per cent) in social science, another six papers (13.6 per cent) in information systems and four papers (9.1 per cent) in the arts and humanities.

Regarding the file drawer problem, the funnel plot statistics and the fail-safe N technique were calculated. All pairwise relationships passed the test, indicating no severe bias in this study. The skewness of data was also explored, and no outlier was found.

4.2 Hypotheses testing

[Table I](#) shows the results of the statistical analyses for testing *H1* to *H4*. All relationships between extrinsic/intrinsic motivation and knowledge sharing behavior were significant with no intervals straddling zero. This confirms *H1a/b* and *H2a/b*, in that intrinsic as well as extrinsic motivation have a positive relation with knowledge sharing. The sample-size weighted correlation average of the self-enjoyment–knowledge sharing behavior relationship is the highest ($r_u = 0.437$), followed by self-efficacy–knowledge sharing behavior ($r_u = 0.385$). The effect sizes of extrinsic motivation were low to medium, reciprocity ($r_u = 0.245$) and rewards ($r_u = 0.315$). This suggests that intrinsic motivation is more important than extrinsic motivation, thus *H3* was supported. To test *H4*, we multiplied intrinsic motivation with extrinsic motivation. All relationships were significant with no intervals crossing zero, thus *H4* was supported, implying that extrinsic motivation strengthens intrinsic motivation.

To test our moderating *H5* to *H7*, we investigated the significance of differences by calculating the Q-between values and comparing 95 per cent confidence intervals. [Table II](#) provides an overview of the results. *H5* predicted a moderating role of individual characteristics. As for age (*H5a*), results showed a significant moderating effect with

Table I Results of correlation and sample size

Pairwise relationship	No. of studies (<i>k</i>)	Cumulative sample size	Sample-size weighted correlation average r_u	95% confidence interval		Q statistic for heterogeneity test (degree of freedom)
				Lower bound	Upper bound	
SEF-KSB	20	7,141	0.385	0.360	0.410	437.40*(19)
SEN-KSB	14	4,845	0.437	0.406	0.468	314.703*(13)
REC-KSB	18	6,098	0.315	0.288	0.343	314.162*(17)
REW-KSB	18	6,276	0.245	0.218	0.271	345.044*(17)
SEF × REC-KSB	8	3,716	0.133	0.094	0.172	75.448*(7)
SEF × REW-KSB	6	2,981	0.062	0.015	0.110	38.687*(5)
SEN × REC-KSB	7	2,680	0.152	0.105	0.200	74.756*(6)
SEN × REW-KSB	6	2,445	0.059	0.006	0.111	18.781*(5)

Notes: SEF = perceived self-efficacy; SEN = perceived self-enjoyment; REC = reciprocity; REW = rewards; KSB = knowledge sharing behavior; * $p < 0.05$

Table II Moderator analysis of cultural characteristics

Moderator	Estimate (No of studies) [95% confidence interval from lower bound to upper bound]			
	SEF-KSB	SEN-KSB	REC-KSB	REW-KSB
<i>Individual characteristics</i>				
Age mean				
Younger	0.44 (8) [0.39 to 0.49]	0.61 (9) [0.48 to 0.74]	0.44 (7) [0.38 to 0.49]	0.25 (5) [0.17 to 0.33]
Older	0.51 (8) [0.46 to 0.55]	0.51 (3) [0.46 to 0.55]	0.32 (8) [0.27 to 0.37]	0.27 (7) [0.22 to 0.31]
Gender				
More male	0.41 (13) [0.38 to 0.45]	0.65 (8) [0.60 to 0.70]	0.37 (14) [0.34 to 0.41]	0.29 (13) [0.25 to 0.32]
More female	0.54 (4) [0.45 to 0.62]	0.37 (4) [0.28 to 0.45]	0.38 (3) [0.25 to 0.51]	0.26 (2) [-0.17 to 0.70]
<i>Organizational context</i>				
Organizational setting				
Organizational setting	0.41 (9) [0.37 to 0.45]	0.51 (6) [0.44 to 0.58]	0.39 (7) [0.33 to 0.44]	0.30 (10) [0.25 to 0.34]
Open systems	0.37 (11) [0.33 to 0.40]	0.40 (8) [0.36 to 0.44]	0.28 (11) [0.25 to 0.32]	0.21 (8) [0.17 to 0.25]
IT infrastructure				
IT infrastructure	0.49 (13) [0.46 to 0.53]	0.55 (9) [0.51 to 0.59]	0.37 (12) [0.34 to 0.41]	0.34 (11) [0.28 to 0.39]
Non	0.21 (7) [0.17 to 0.26]	0.29 (5) [0.23 to 0.35]	0.21 (6) [0.15 to 0.27]	0.20 (7) [0.16 to 0.23]
<i>Cultural context</i>				
In-group collectivism				
Higher	0.52 (14) [0.49 to 0.55]	0.65 (7) [0.60 to 0.70]	0.37 (11) [0.34 to 0.41]	0.33 (10) [0.29 to 0.37]
Lower	0.14 (5) [0.07 to 0.20]	0.24 (5) [0.18 to 0.29]	0.18 (4) [0.11 to 0.26]	0.13 (4) [0.05 to 0.22]
Uncertainty avoidance				
Higher	0.52 (14) [0.49 to 0.55]	0.66 (5) [0.60 to 0.72]	0.37 (10) [0.34 to 0.41]	0.33 (9) [0.29 to 0.37]
Lower	0.14 (5) [0.07 to 0.20]	0.24 (5) [0.19 to 0.30]	0.18 (3) [0.11 to 0.26]	0.13 (3) [0.05 to 0.22]
Performance orientation				
Higher	0.22 (6) [0.17 to 0.27]	0.27 (5) [0.22 to 0.32]	0.19 (4) [0.13 to 0.25]	0.07 (3) [-0.01 to 0.14]
Lower	0.51 (13) [0.48 to 0.55]	0.71 (5) [0.65 to 0.78]	0.40 (9) [0.36 to 0.44]	0.41 (9) [0.36 to 0.45]
Power distance				
Higher	0.59 (2) [-0.08 to 1.27]	0.77 (1) [0.30 to 1.24]	0.49 (2) [0.32 to 0.65]	0.54 (2) [0.38 to 0.69]
Lower	0.40 (17) [0.37 to 0.42]	0.37 (9) [0.33 to 0.41]	0.28 (11) [0.25 to 0.32]	0.20 (10) [0.16 to 0.23]

Notes: SEF = perceived self-efficacy; SEN = perceived self-enjoyment; REC = reciprocity; REW = rewards; KSB = knowledge sharing behavior

reciprocity in predicting knowledge sharing, implying that the effect of reciprocity was stronger for younger participants. The other moderating effects with age were not significant because the confidence intervals of the different conditions were overlapping. Thus, *H5* receives partial support. Both intrinsic motivational factors were moderated by gender. In particular, the influence of self-efficacy on knowledge sharing was stronger in studies with more female participants, as predicted in *H5b*. However, the opposite was true for the effect of self-enjoyment on knowledge sharing, implying that self-enjoyment was a more important motivation factor in male-dominated samples. The extrinsic motivation factors did not show significant effects with gender. Thus, *H5b* receives only little support.

H6 was concerned with the moderating role of organizational context. As expected, self-enjoyment, reciprocity and rewards had a stronger effect on knowledge sharing in organizational settings compared with open systems. The moderating effect of self-efficacy showed the same tendency; however, the confidence intervals were slightly overlapping. This provides support for *H6a*. *H6b* was fully supported because all motivation factors had a stronger impact on knowledge sharing when IT infrastructure was present.

H7 predicted a moderating role of cultural context. As expected, the effects of motivational factors are stronger in high in-group collectivistic as well as in high uncertainty avoidance

cultures, thus providing support for *H7a* and *H7b*. Whereas performance orientation interacted with motivational factors, the effect was in the opposite direction to *H7c*. Results show that motivational factors have a stronger effect on knowledge sharing in cultures with low performance orientation. Thus, *H7c* was not supported. Power distance did not moderate the effect of intrinsic motivation on knowledge sharing, whereas extrinsic motivation had a stronger effect on knowledge sharing in high power distance cultures. Thus, *H7d* finds no support.

5. Discussion

Our meta-analytical results from 44 studies involving 14,023 participants confirms previous studies (Chang and Chuang, 2011; Lin, 2007; Wasko and Faraj, 2005) showing that both intrinsic and extrinsic motivators are positively related with knowledge sharing behavior. The effect sizes are of substantial size ranging from $r = 0.245$ to 0.437 . This finding is not surprising for intrinsic motivation, as knowledge sharing is often considered as a voluntary behavior, such that an individual does not normally share valuable knowledge without any intrinsic motivation (Tang *et al.*, 2016) and the active participation and cooperation of the knower (Nonaka and Takeuchi, 1995). The result of extrinsic motivation is noteworthy because extrinsic motivation has shown an inconsistent effect on knowledge sharing: positive (Kankanhalli *et al.*, 2005), insignificant (Lin, 2007) and even negative (Bock *et al.*, 2005). This study shows that although the impact of extrinsic motivation on knowledge sharing was mixed, the overall impact across the studies is positive.

Interestingly, our findings show that intrinsic motivation has a stronger influence on knowledge sharing than extrinsic motivation, supporting prior research (Cho *et al.*, 2015; Foss *et al.*, 2009; Pee and Lee, 2015). Previous studies tended to focus on the effects of motivation on knowledge sharing behavior but omitted the comparative strength of the effects between intrinsic and extrinsic motivation.

Another interesting finding of this study is the additive effect of two types of motivation on knowledge sharing. Intrinsic motivation and extrinsic motivation not only coexist but also support each other to affect knowledge sharing. The interaction between the two types of motivation has been rarely investigated. Our arguments and empirical evidence show that extrinsic motivation and intrinsic motivation have additive effects on knowledge sharing behavior, corroborating prior, related research (Amabile, 1993; Cameron and Pierce, 1994; Davis *et al.*, 1992; Vansteenkiste *et al.*, 2004; Wiersma, 1992). However, this result contrasts with some contemporary psychology research such as Zhao *et al.* (2016), which demonstrates that extrinsic motivation has a hidden cost when undermining intrinsic motivation. The different result may be due to contextual differences such as online knowledge sharing in a Q&A virtual community.

Although our findings largely confirmed and substantiated prior research (Ko *et al.*, 2005; Kwahk and Park, 2016; Lin, 2007) on the direct effects of motivation, our study makes a major contribution by identifying that the variation in the previous studies may originate from individual and contextual boundary conditions. Our findings showed that a substantial portion of the variance was explained by moderating effects of a range of variables. Thus, our study revealed important boundary conditions that help increase our understanding of earlier equivocal findings. The moderating analyses suggest that individual characteristics, organizational contexts and cultural contexts moderate the association between motivation and knowledge sharing behavior.

First, in terms of individual characteristics, the relationship between rewards and knowledge sharing behavior was moderated by individuals' age. Findings imply that younger individuals tend to be more sensitive to rewards than the older ones in knowledge sharing. Thus, we extend findings of Homburg *et al.* (2003) on the moderating roles of age in the knowledge sharing context. Results also showed that gender matters. This means if women

have a sense of self-efficacy, they are more likely to share knowledge than men. However, in contrast to expectation, men tend to be more active in sharing knowledge if they have self-enjoyment when considering knowledge sharing as an enjoyable activity. This result is in accord with the findings of other research (Minbaeva Ben-Ner *et al.*, 2004) which confirmed that men and women are different in their motives for knowledge sharing.

Second, regarding organizational contexts, the effects of self-enjoyment, reciprocity and rewards on knowledge sharing behavior in an organizational setting are stronger than in an open system. This is understandable because in an organizational setting, individuals have some extent of trust and close ties with other members (Martin-Rios, 2014); therefore, they are more likely to share knowledge if they are motivated. However, the result shows that organizational settings did not moderate the relationship between self-efficacy and knowledge sharing. This finding implies that if individuals are confident about their knowledge, they tend to share knowledge due to the interest of individuals regardless of organizational settings. This result supports the findings of previous research (Chen and Hung, 2010) when self-efficacy often has a strong influence on knowledge sharing in both organizational settings and in open systems. Furthermore, the results suggest that with IT infrastructure, the relationship between motivation and knowledge sharing is significantly enhanced. This is also one of the reasons for the prevalence of online communities and online platforms to improve knowledge sharing (Charband and Navimipour, 2016; Shen *et al.*, 2010).

The moderating effects of cultural context were particularly intriguing. Our results corroborate the findings of Wilkesmann *et al.* (2009) and Witherspoon *et al.* (2013), showing that cultural context moderates the relationship between motivation and knowledge sharing. Extending prior research, we show that the moderating effects of cultural contexts seem to be stronger for intrinsic motivation than extrinsic motivation. This implies that as perception is adaptive, cultural factors often direct individual interest and belief, thus moderating the influence of intrinsic motivation to share knowledge. Building on and extending prior studies (Charband and Navimipour, 2016; Witherspoon *et al.*, 2013), we deepen our understanding about the moderating role by investigating the moderating effects of four different cultural dimensions. We found that in societies that scored high on collectivism, uncertainty avoidance and lower performance orientation, the effects of intrinsic and extrinsic motivation on knowledge sharing are stronger. However, contrary to our expectations, in societies with higher power distance, a stronger effect from extrinsic motivation on knowledge sharing was found. One explanation is that individuals likely feel encouraged by superiors when extrinsic motivators are enhanced. As a result, individuals are confident to show their values and contribution by sharing their knowledge (Wilkesmann *et al.*, 2009).

5.1 Theoretical contributions

The effects of motivation on knowledge sharing behavior have been examined extensively in the literature, but the findings have been inconsistent (Chung *et al.*, 2016; Nguyen *et al.*, 2019; Quigley *et al.*, 2007; Witherspoon *et al.*, 2013). The results of our meta-analysis provide the basis for several important theoretical contributions.

First, this study contributes to an increased understanding of motivation theories (Steers *et al.*, 2004) in the knowledge sharing context by conducting a meta-analysis to establish true relationships between motivation and knowledge sharing behavior. Our results demonstrate that both intrinsic and extrinsic motivation are beneficial for knowledge sharing. Moreover, our simultaneous analysis revealed that intrinsic motivation factors are more important than extrinsic motivation factors, and both motivation factors have an additive effect on knowledge sharing. These findings underline the importance of considering both intrinsic and extrinsic motivation (Cho *et al.*, 2015; Hau *et al.*, 2013; Hung *et al.*, 2011; Tang *et al.*, 2016).

Second, a major contribution of this study is the identification of contextual factors that influence the effectiveness of motivation on knowledge sharing. Our results revealed that individual characteristics, organizational contexts and cultural contexts serve as important boundary conditions. Thus, our study makes an important contribution to motivation theory (Steers *et al.*, 2004) and the knowledge management literature (Chung *et al.*, 2016; Nguyen *et al.*, 2019; Quigley *et al.*, 2007; Witherspoon *et al.*, 2013) by explicating how the context facilitates or hinders the effects of individual motivation on knowledge sharing. Thus, the study extends the theoretical literature and serves as a guideline for future researchers to consider moderators across a range of studies on knowledge sharing behaviors.

5.2 Practical implications

The findings of this study suggest some guidelines for managers to improve knowledge sharing. First, as the findings of this study suggest that both intrinsic and extrinsic motivation are important influencers of knowledge sharing, managers should strengthen both these types of motivation. To enhance intrinsic motivation, building self-efficacy and self-enjoyment should be considered. For self-efficacy, managers should indicate to members that their knowledge sharing significantly contributes to the success of their workgroups (Chen and Hung, 2010). The provision of clear and unambiguous feedback is very helpful in improving self-efficacy perception (Parker, 1998). Other interventions such as training can be considered to improve self-efficacy (Parker, 1998). Managers also need to increase the level of self-enjoyment by enhancing the positive mood state in knowledge sharing (Lin, 2007). Improving job design with more autonomy also may develop self-enjoyment perception (Pee and Lee, 2015).

For extrinsic motivation, managers need to establish and maintain an effective knowledge sharing environment and a positive culture to foster the targeted reciprocal relationships and interpersonal interactions of members. For example, managers can create an information system that publically recognizes knowledge providers and beneficiaries (Kwahk and Park, 2016). Managers also need to focus on the design of the reward system that motivates employees (Froese *et al.*, 2019; Wickramasinghe and Widyaratne, 2012). The reward system should offer a combination of tangible extrinsic rewards as well as intangible and intrinsic rewards for employees to share their knowledge.

Importantly, all measures which smooth the way in which knowledge is shared need to consider individual characteristics, organizational contexts and culture contexts, so that intrinsic and extrinsic motivators can be enhanced appropriately.

Second, the results of the moderating effects also have important implications. Organizations may consider customized motivational factors to better motivate employees of different age-groups and gender. For instance, strengthening bonds via periodic, face-to-face gatherings among younger individuals may help to increase the influence of reciprocity on knowledge sharing, especially when all of them are active in the knowledge sharing process. Self-enjoyment could be emphasized for men, e.g. through gamification of knowledge sharing. For women, the impact of self-efficacy on knowledge sharing behavior is stronger; thus, managers can offer more training for women to make them more confident about their knowledge.

In organizational settings, the effect of self-enjoyment, reciprocity and rewards on knowledge sharing behavior tends to be stronger. Managers should focus on organizational culture that supports employees to collaborate and share valuable knowledge to achieve organizational goals. Furthermore, the results of this study show that IT infrastructure can facilitate the influence of motivation on knowledge sharing; therefore, managers should consider investment in IT to enhance effective online knowledge sharing.

Considering cultural differences, multinational organizations may consider different motivation schemes across countries modified to better suit different countries. For instance, self-efficacy and self-enjoyment would be emphasized in collectivistic cultures, whereas rewards and reciprocity would be emphasized in low power distance cultures.

5.3 Limitations and avenues for future research

There are some limitations of this study, which present avenues for future research. First, it may be worth investigating additional moderators in future studies. Based on prior research (Wilkesmann *et al.*, 2009), we investigated the moderating role of cultural context with four dimensions (collectivism, uncertainty avoidance, performance orientation and power distance) of the GLOBE study (House *et al.*, 2004). Future research may probe more deeply into the moderating roles of other cultural dimensions and relying on other cultural frameworks, e.g. tight and loose cultures (Gelfand *et al.*, 2011). Further extending cross-cultural research, future research could also investigate the role of motivation and knowledge sharing between employees of different nationalities, from a diversity perspective (Bader *et al.*, 2019) and/or an expatriate perspective (Stoermer *et al.*, 2017). Other potential moderators that may influence the relationship between motivation and knowledge sharing behavior, e.g. type of job, industry characteristics or type of knowledge (Wang and Noe, 2010), were not included in our moderator analyses due to a lack of relevant information reported in the studies, presenting it a worthy avenue for future investigations.

Second, building on previous studies (Ko *et al.*, 2005; Kwahk and Park, 2016; Lin, 2007; Suppiah and Sandhu, 2011), we examined four salient motivators in this study. Future research may consider exploring other factors, e.g. social interaction ties, management support and leadership (Cho *et al.*, 2019; Jia *et al.*, 2018; Wickramasinghe and Widyaratne, 2012), to provide a more comprehensive picture about knowledge sharing. In addition, trust may also be included in a subsequent meta-analysis examining the moderating effects in the relationship between motivation and knowledge sharing behaviors in a range of contexts – online and physical settings (Jadin *et al.*, 2013; Mooradian *et al.*, 2006; Wang *et al.*, 2014).

Third, future research can consider the extension of the research framework by examining post knowledge sharing behavior. Examining post knowledge sharing behavior such as individual performance or creativity and innovation is another possible direction for future research.

Finally, as most of the preceeding discussion is on voluntary sharing of knowledge, or what some researchers have classified as “cooperation bias” (Witherspoon *et al.*, 2013), future research can examine the “dark side” of knowledge sharing when individuals share irrelevant and worthless knowledge or worse still refuse to share value-creating knowledge or engage in power and politics through knowledge hoarding activities.

6. Conclusion

This study provides a more complete understanding of the role of motivation in increasing knowledge sharing. The findings show that both intrinsic and extrinsic motivation significantly influence knowledge sharing behavior and that intrinsic motivation has a stronger effect and is amplified by extrinsic motivation. Our theoretical reasoning and empirical results revealed that the effect of motivation on knowledge sharing is moderated by individual demographics, organizational contexts and cultural contexts.

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Further reading

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