

MOTIVATED TO SHARE?

DEVELOPMENT AND VALIDATION OF A DOMAIN-SPECIFIC SCALE TO MEASURE KNOWLEDGE-SHARING MOTIVES

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ABSTRACT

Purpose

This paper develops and validates a scale to measure knowledge-sharing motives at work. It is aimed to construct a scale, which is explicitly different from knowledge-sharing behavior and to develop a comprehensive and domain-specific scale for this special kind of work motivation.

Design

The constructed scale was tested in two studies. Survey data (n=355) were used to perform an EFA. Results were further tested on survey data from the core public sector (n=314) and the health sector (n=315). A CFA confirms the results in both samples. The developed scale was further validated internally and externally.

Findings

The analysis underlines that knowledge-sharing motivation and knowledge-sharing behavior are different constructs. The data suggest three dimensions of knowledge-sharing motives: appreciation, growth and altruism, and tangible rewards. While it is suggested that the developed scale works in the public as well as the private sector context, it is found that knowledge sharing of public employees is merely driven by ‘growth and altruism’ and ‘appreciation of co-workers’.

Originality

No comprehensive and reproducible scale to measure knowledge-sharing motives, which is different from behavior and domain-specific as well, is available in the literature. Therefore, such a scale has been constructed in this study. Furthermore, this study uses samples from different organizational sectors to deepen the understanding of knowledge sharing in context.

INTRODUCTION

Organizational knowledge management activities frequently fail. Especially in the age of digital transformation, it is taken for granted that technical solutions will work and that employees want to share their knowledge within these systems (Friedrich *et al.*, 2020). However, a central requirement of knowledge management is the employees' willingness to share their knowledge. A high knowledge-sharing motivation (KSM) ideally leads to knowledge-sharing behavior (KSB), and shared knowledge can then be conserved, diffused, and utilized. This study focuses on this important precondition of knowledge management and, in particular, knowledge sharing: knowledge-sharing motivation.

Motivation psychology differentiates between *motivation* and *intention* regarding decisions and subsequent *behavior*. In the literature on knowledge management, this distinction between motivation, intention, and behavior does not appear. Even when KSM is mentioned specifically, in many cases the actual behavior, a behavioral intention, or an attitude towards knowledge sharing is measured instead.

In this article a scale to measure KSM was developed, which is explicitly distinct from constructs measuring planned or intended behavior. The constructed scale was validated in two studies: a 2017 web survey of 350 respondents from the German public sector, and a 2018 web survey of 629 German public employees in the core administration (n=314) and the health sector (n=315). Results of an exploratory factor analysis suggest that KSM and KSB, as pre- and post-actional stages in human behavior, can indeed be clearly distinguished and should be treated differently in measurements. The developed scale to measure KSM showed high internal consistency and three dimensions could be identified. These dimensions were confirmed by confirmatory factor analysis and the estimated model showed a good model fit and was proven to be valid both internally and externally.

This study adds three important contributions to the literature: *First*, the difference between behavior and motivation in the context of knowledge sharing is conceptualized and empirically proven in this study, which is missing in the literature on knowledge management to date. It is important to differentiate motivation from behavior, when, for example, empirically analyzing determinants of knowledge sharing of individuals.

Second, this study strengthens the relevant but understudied topic of knowledge sharing in public administration research. Knowledge is an important resource for public organizations. However, in contrast to other resources such as finances or personnel, this topic remains scarce in the public administration literature. This study deepens our understanding of knowledge sharing and its drivers in the public sector.

Third, by investigating a more specific form of work motivation, this study advances the literature on general work motivation. By arguing that general work motivation is not always a good predictor of specific work behaviors, such as knowledge sharing, this study adds to the literature on the need for more specific forms of (work) motivation, hence domain-specific motivation (Martin, 2008). This study links the beginning literature on domain-specific motivation with the knowledge management literature.

The paper is organized as follows. First, the state of research concerning knowledge sharing and KSM is discussed. It is focused on the empirical measurement of KSM. Subsequently, the theoretical framework is presented, deriving the hypothesis on the differentiation between motivation and behavior. Additionally, possible dimensions of KSM are derived from models and empirical findings on human needs and motives in the setting of work motivation. Finally, after a description of scale development and validation methods, results are presented and discussed.

STATE OF RESEARCH

Knowledge Sharing and Knowledge Sharing Motivation

Knowledge sharing is the exchange of knowledge among individuals, teams, units, or organizations (Lin, 2007). In this context, knowledge is usually defined as selected and interpreted information (Nonaka and Takeuchi, 1995). The term “knowledge sharing” is usually used to describe a unidirectional exchange of knowledge, such as when one person explains a work procedure to a co-worker or records knowledge about a process in a guideline. Knowledge sharing can also be bi- or even multidirectional, such as in team meetings or consulting processes. In this study, however, knowledge sharing is defined as the donation of knowledge on the individual level.

Knowledge sharing is one critical part of knowledge management. As Law and Ngai (2008, p. 2343) point out, “[s]imply put, a lack of sharing may inhibit or hinder knowledge management.” Ultimately, knowledge sharing is seen as a determinant of individual and organizational learning (Nugroho, 2018), performance (Lin *et al.*, 2020; Pandey *et al.*, 2021), job and life satisfaction (Kianto *et al.*, 2016; Ahmad and Karim, 2019; Fischer and Döring, 2022), and innovative capability (Wang and Hu, 2020).

Knowledge sharing is influenced by multiple determinants. These determinants can be either internal or external factors. *External* factors found to determine knowledge sharing are the organizational context in terms of in-group collectivism, uncertainty avoidance, performance orientation and power distance (Nguyen *et al.*, 2019), HR practices for knowledge sharing (Andreeva and Sergeeva, 2016), job autonomy (Llopis and Foss, 2016), gamification of knowledge management systems (Friedrich *et al.*, 2020), or perceived fairness within an organization or the community (Cai *et al.*, 2022). *Internal* determinants of knowledge sharing are, for example, a positive mood (Tang *et al.*, 2020), age (Nguyen *et al.*, 2019), or motivation

(Zenk *et al.*, 2021). The latter is called “knowledge-sharing motivation.” The term is usually used to describe the motivation of the person who donates knowledge.

KSM has been confirmed to explain KSB (Henttonen *et al.*, 2016). This is consistent with the literature on work behavior in general (Pinder, 1998), which shows that motivation is one, but not the only, determinant of behavior.

Work motivation and the process of human action

The motivation to share knowledge is a special kind of work motivation. Motivation can be defined as “a set of energetic forces that originate both within as well as beyond an individual's being, to initiate work-related behavior and to determine its form, direction, intensity, and duration” (Pinder, 1998, p. 11). A basic assumption of process models of motivation is the distinction between motivation, volition, intention, and behavior as stages in the process of human action. This succession of stages in human action is widely accepted and also used in the literature aside from work motivation (e.g., prosocial activity: Schott *et al.*, 2017).

However, motivation cannot be observed directly and must, therefore, be inferred (Kanfer, 2012, p. 456). That is frequently done with behavioral measures, which “is often problematic since performance is not univocally determined by motivation, and is also determined by employee knowledge and skills and/or the availability (or lack) of external resources (e.g., equipment) necessary for successful performance” (Kanfer, 2012, p. 457).

Nevertheless, it is this distinction between motivation and behavior which does not occur in the literature on knowledge sharing. When the motivation to share knowledge is operationalized, in many cases the actual behavior or a behavioral intention is measured (Appendix A). This missing differentiation is problematic: By not distinguishing knowledge-sharing motivation and knowledge-sharing behavior in measurement systematically, the

measurement of both constructs is not valid and the former cannot be analyzed as a determinant of the latter in a sound way.

Models of Knowledge Sharing Motivation

Findings on knowledge-sharing motives are rather fragmented and often investigate single motives only instead of comprehensive models integrating multiple motivation factors (Nguyen *et al.*, 2019). However, a first comprehensive model was developed by Lin (2007). She identified expected rewards, reciprocal benefits, self-efficacy, and enjoyment in helping others as determinants of knowledge-sharing intentions. She already pointed to fundamental differences between extrinsic motivators (rewards and reciprocal benefits) and intrinsic motivators (self-efficacy and helping others). However, her model can not be used as a conceptualization of knowledge-sharing motivation, as for example, self-efficacy is rather related to ability than motivation. Moreover, Nguyen *et al.* (2021) mention that the focus on these four single determinants might be too limited.

An initial theoretical model of KSM that actually deals with motivation instead of behavior was developed by Gagné (2009). She proposed a continuum of KSM following the continuum from amotivation via controlled motivation to autonomous motivation referring to self-determination theory (Deci and Ryan, 2008). Lam and Lambermont-Ford (2010) and Law *et al.* (2017) similarly developed a model of KSM but did not propose and test a precise measurement construct.

Many authors build on this idea of situating knowledge-sharing motivation on the continuum from intrinsic to extrinsic motivation based on self-determination theory (e.g., Llopis and Foss, 2016; Andreeva and Sergeeva, 2016). However, in doing so they use rather broad operationalizations and define intrinsic knowledge-sharing motivation by, for example, liking or enjoying to share knowledge. While the results of these studies can tell us whether

knowledge sharing is extrinsically or intrinsically motivated, they can not tell us why exactly people share their knowledge – what are their exact motives (Todorova and Mills, 2018)?

Hung *et al.* (2011) constructed a measure that can be understood as motivation (in contrast to behavior) and that is more specific about the motives to share. They designed “knowledge-sharing altruism” as a mixture of helpfulness and one’s pleasure in sharing knowledge, and “knowledge-sharing reciprocity” as the expectation of reciprocal knowledge sharing. Gu and Gu (2011) suggested a more comprehensive construct for measuring KSM. They identify four dimensions of KSM: existence, relationship, growth, and norm motivation. The precise wording of these items, even on inquiry, was not revealed by the authors. Therefore, it is not possible to replicate their items.

Reinholt *et al.* (2011) and Chen *et al.* (2012) both used their own scale to measure KSM, but they neither analyzed dimensions nor validated their scale. Instead, they compiled items into an index to use them directly as an independent variable in their model.

Stenius *et al.* (2017) tested Gagné’s (2009) model of KSM and suggested that identified motivation better explains KSB than intrinsic motivation does. However, they used a general measure of autonomous motivation to measure its influence on KSB instead of developing items specific to knowledge sharing. This also applies to Gagné *et al.* (2019), who showed that identified and intrinsic motivation explain KSB, while externally regulated motivation explains knowledge hiding behavior. Furthermore, Stenius *et al.* (2017) limited KSB to active knowledge sharing in work meetings. While it is worthwhile to provide an example of knowledge sharing to respondents, this may influence the results. As Fischer (2018) pointed out, knowledge sharing assumes different behavioral patterns – proactive or responsive (on request), direct (person-to-person), or indirect (person-to-medium) sharing. Stenius *et al.* (2017) focused on proactive and direct knowledge sharing. Other motives might determine other types of KSB.

As can be seen from this review of the literature on KSM and its measurement (see Appendix A for a summary), there remains a gap in the literature when it comes to measuring knowledge-sharing motives differently than behavior or a behavioral intention and in a domain-specific way. Hence, to measure a comprehensive set of *specific motives* rather than motivation in general.

If motivation is measured in general instead, as is done, for example, by Gagné *et al.* (2019), Llopis and Foss (2016), Andreeva and Sergeeva (2016) or Reinholt *et al.* (2011), we cannot finally understand the theoretical mechanisms behind knowledge sharing. It is argued here that if KSM is comprised of motives related to this special kind of work motivation, one can more easily explain what drives employees to share knowledge and derive work designs or management interventions fostering this behavior. Hence, it is worthwhile to construct a domain-specific KSM based on specific motives. A similar discussion can be found in the literature on children's motivation to learn in school, where it was shown that general motivational measures could not represent different intrinsic motivations in reading and mathematics (Wigfield *et al.*, 2004, p. 300).

THEORY

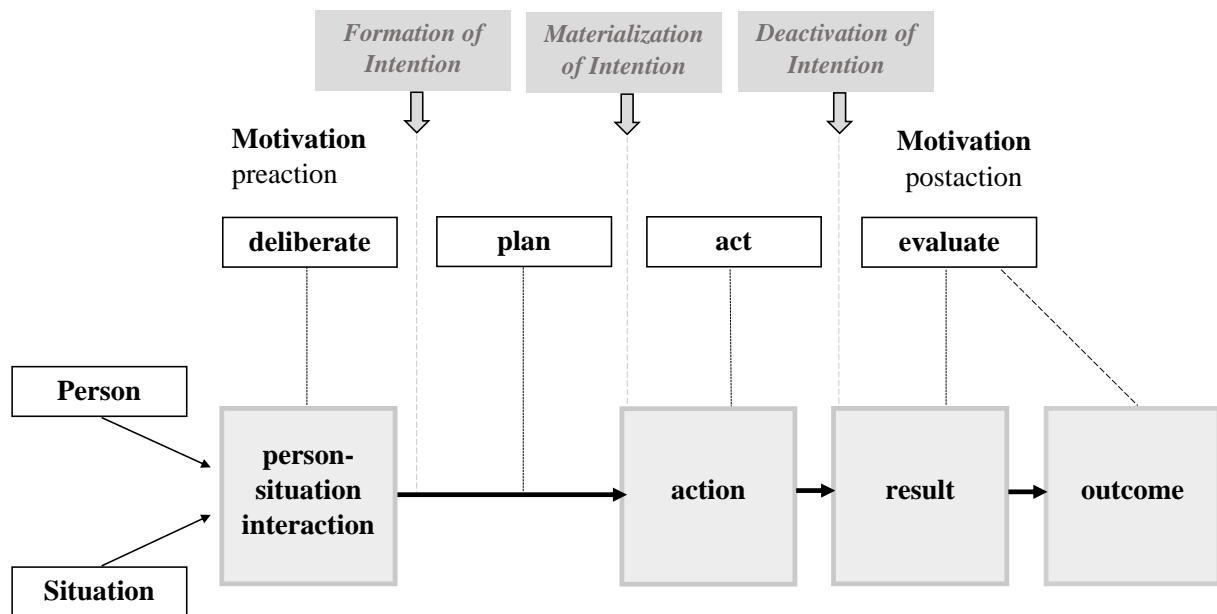
Theories on (work) motivation examine either the process or content of motivation. This study's theoretical model is derived from both lines of thought.

Motivation as a process

When motivation is analyzed from a process perspective, the focus is usually on how motivation results in behavior. Heckhausen's (1989) Rubicon model is a frequently used approach to examining different stages of human action. In his model, represented in Figure 1, motivation forms a pre-decisional stage derived from personal preferences and situational

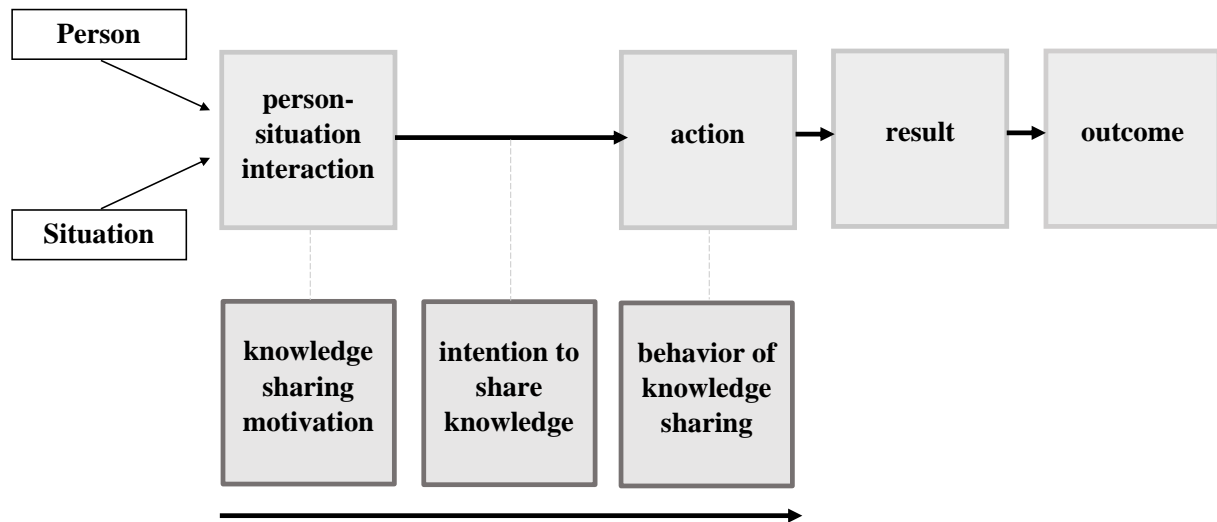
incentives and their interdependence. Motivation affects *intention*-building processes and resulting *behavior* but is not the sole cause of intention and behavior (Pinder, 1998).

Figure 1: Stages of human action in the Rubicon model and the terms, adapted from Heckhausen and Heckhausen (2010, p. 8).



By translating this model into the context of knowledge sharing, it can be expected that KSM derives from the interaction of personal motives and situational influences. Thereby, KSM is at a pre-actional and even pre-decisional stage of human action. Intention-building processes then control which motivational tendencies – there may be others besides KSM – are transferred into action. Therefore, a decision is first formed (knowledge-sharing intention) and then influenced again by personal and situational variables and transferred into action (KSB). Results and outcomes of this behavior, in turn, influence future KSM. This transfer of the Rubicon model to the knowledge-sharing context is outlined in Figure 2.

Figure 2: Motivation, intention, and behavior of sharing knowledge in the Rubicon model.



Content of motivation

Content theories of motivation focus on motivation itself and its underlying personal motives. Personal motives are drivers of motivation and behavior and are based on human needs, e.g., physical and mental health, friendship, or autonomy. As already shown in the literature review above (see also Appendix A), several motives are discussed in the literature to affect knowledge sharing. Most of them refer to Alderfers (1972) ERG theory (existence, relatedness, and growth) and McClellands (1987) basic human needs (achievement, affiliation, and power).

First, *relatedness and affiliation* are discussed as drivers of knowledge sharing (e.g., Amayah, 2013; Nguyen, 2019). “[...] Their satisfaction depends on a process of sharing or mutuality. People are assumed to satisfy relatedness needs by mutually sharing their thoughts and feelings” (Alderfer, 1969, p. 146). Simultaneously, Kianto *et al.* (2016) argue that knowledge sharing fosters job satisfaction because knowledge donors experience a feeling of being valuable and important to their colleagues and organization. The relatedness motive also refers to the idea of reciprocity in knowledge sharing. Lin (2007), for example, found that the

expectation of reciprocal knowledge sharing and strengthening of relationships increases knowledge-sharing intentions and produces more positive attitudes about knowledge sharing. However, in their meta-analysis, Nguyen *et al.* (2019) found reciprocity to be the weakest determinant of knowledge-sharing behavior compared to more intrinsic motives or rewards.

Second, motives of *achievement and power* are also discussed as determinants of knowledge sharing (Amayah, 2013) and, even more, of knowledge hoarding (Willem and Buelens, 2006). Power motivation is “a desire to influence, control, or impress others” (Fodor, 2010, p. 3). Accordingly, the desire to be recognized as an expert through knowledge sharing is based on the power motive. Hosen *et al.* (2021), for example, found reputation to be an important motivator for knowledge sharing.

Achievement motivation can include both the hope of success and the fear of failure (Pang, 2010). Accordingly, if the achievement motive drives knowledge sharing, individuals might either share their knowledge, if they expect to succeed in the workplace through this behavior, or they might avoid knowledge sharing out of fear that their mistakes might be detected or that they might not be able to share their knowledge successfully. Andreeva and Sergeeva (2016) operationalized extrinsic motivation to share knowledge under the umbrella of such an achievement and power motive and showed a slightly positive influence on knowledge-sharing behavior. Rewards and enhanced job security are examples to fulfill these achievement needs.

Third, *growth and personal development* are also expected to serve as motives for knowledge sharing. “Growth needs include all the needs which involve a person making creative or productive effects on himself and the environment” (Alderfer, 1969, p. 146). They belong to the power motive if growth is seen as career promotion at the workplace. If growth is instead seen as individual learning, it constitutes a more intrinsic form of motivation. Such a learning goal orientation is related to the desire to connect additional and demanding behaviors

(Thomas and Gupta, 2022). One might get the impression that such a need is rather related to the collection than the donation of knowledge. However, individuals with strong learning and development needs focus on the development of new skills and the mastery of new situations. Sharing knowledge might constitute such a challenge (Thomas and Gupta, 2022). Additionally, as knowledge sharing is often seen as a reciprocal process, by sharing knowledge individuals might also count on getting “new knowledge” back.

Fourth, Gu and Gu (2011) also found that knowledge sharing can be motivated by just *following organizational or societal norms*, even though knowledge sharing might not be mandatory. However, individuals perform that behavior because they have a feeling of obligation (Thomas and Gupta, 2022). According to Lindenberg (2001, p. 335), such a “feeling that one must follow a particular rule” can be categorized as normative intrinsic motivation. Individuals always choose reference groups to follow in terms of beliefs and behavior. Hence, these reference groups can produce social pressure either in favor or against knowledge sharing (Choi *et al.*, 2020). Chen *et al.* (2018), for example, find too that knowledge sharing takes place because it is perceived as a requirement.

Fifth, *altruism*, which is based on prosocial motives, is also discussed as a driver for sharing knowledge. Prosocial motives are “the desire to expend effort to benefit other people” (Grant, 2008, p. 48). Hence, when a person enjoys helping others and feels good when he or she can be of help, such a motive might drive sharing own knowledge to help others. Lin (2007) showed such a positive influence of enjoying to help others on knowledge sharing intentions. However, Hung *et al.* (2011) could not show prosocial motives to affect KSB in a sample of students.

The above-described possible motives for knowledge sharing extracted from the literature served as a basis for developing measurement items for the scale to measure KSM.

Item generation, scale development, and initial validation are described in the following chapter.

METHOD

The main approach of this paper is to develop a scale for measuring “knowledge-sharing motivation” that is domain-specific and explicitly distinct from constructs measuring behavior. Scale development is usually divided into three general steps (DeVellis, 2017): *First*, items have to be generated; *second*, a scale combining these items has to be developed and, *third*, this scale has to be evaluated. The procedure employed in every step of this scale development process relied on guidelines provided by Boateng *et al.* (2018) and DeVellis (2017).

Item generation

Development of items and their wording to measure knowledge-sharing motives relied on existing research. Boateng *et al.* (2018) describe that as the deductive approach to scale development. Possible motives for knowledge sharing retrieved from the literature served as a basis as well as existing scales for single motives of knowledge sharing (Appendix A). Based on the literature review it was chosen to incorporate motives referring to relatedness, achievement, growth, norms, and altruism. Some of these dimensions are debated in the literature and findings are inconsistent (e.g. the impact of rewards or norms). However, Boateng *et al.* (2018, p. 5) recommend including items that are “broader and more comprehensive than one's own theoretical view of the target [and that] content should be included that ultimately will be shown to be tangential or unrelated to the core construct.”

For each dimension, a larger set of items was developed (altogether 40 items). This suits the recommendation to start with an item pool twice as long as the final scale (Weiner, 2013). As recommended by DeVellis (2017) and Boateng *et al.* (2018) this larger set of items was

reviewed in two steps: First by academic peers and, after excluding and rephrasing some of the items, by employees as representatives of the target population. This review again led to excluding and reformulating items. The formulation of this first reduced set of items is displayed in Appendix B.

Study 1: Scale development

These preliminary items were tested using a web survey composed of the developed items for measuring *KSM* (16 items), *KSB* (7 items), and demographics. *KSB* is measured to separate the construct from *KSM* and to validate the scale. Most of the items were measured with a five-point Likert scale. Items forming a matrix were randomly rotated to exclude priming or order effects. The survey started with items on motivation, followed by items on behavior. This order was chosen to avoid respondents' sense-making of their behavior.

KSB was measured according to the scale of Bock and Kim (2001). The provided items were adapted to the organizational context and complemented by items suggested in peer review and pretest. All items referred to knowledge sharing on the same hierarchical level (with co-workers instead of superiors or subordinates). One of the seven items reads: "How often do you share the following types of information with your co-workers: reports and official documents like a record?" Instead of Bock and Kim (2001), who measured these items with a five-point scale ranging from "very rarely" to "very frequently," it was decided to use a time-specific, seven-point scale ranging from "less than once a month" to "several times a day."

Data were collected from a sample of German public employees enrolled in an online panel. The sample consists of employees working on different federal levels (federal, federal state, municipality) in different fields of activity in the core administration and on different management levels (executive officer, leader, manager). From 514 respondents, early drop-outs and screen-outs due to another profession have been removed, resulting in 355 cases. According

to Comrey and Lee (1992, p. 217), this sample size is appropriate for factor analysis and scale development. Table 1 gives a summary of the sample.

Table 1: Sample description (Study 1)

Variable	N	Mean	SD	Min	Max
Age	311	44.2	10.4	21	65
Female	312	0.47	0.5	0	1
Supervisory status	312	0.26	0.44	0	1
Years of tenure	311	21.29	11.41	0	47

Study 2: Further validation

To confirm the dimensions of KSM resulting from this first study, a second web survey was designed and tested on two samples, employees from the core public administration (n=314) and employees from the health sector (n=315), to confirm the results in another field of work. Table 2 shows a description of the samples.

Table 2: Sample description (Study 2)

Variable	N	Mean	SD	Min	Max
Age	609	45.10	10.29	22	80
Female	618	0.61	0.49	0	1
Supervisory status	615	0.29	0.45	0	1
Years of tenure	615	20.20	11.23	0	47

KSM was measured by a set of items that proved useful in Study 1. Some items were reformulated to widen the answer distribution. *KSB* was measured according to a set of items measuring the mode of knowledge sharing (direct/indirect and proactive/responsive).

Several measures were used to validate the scale of knowledge-sharing motives. First of all, a general measure to assess KSM (four items) was used to analyze the convergent validity of the developed construct. One of these general items reads: “I enjoy sharing my work-related

knowledge with my co-workers.” *Job satisfaction* and *proactiveness* are related constructs that were used to validate the scale. Job satisfaction was used because a significant relationship to knowledge sharing had been identified (Kianto *et al.*, 2016). It was measured according to Fischer and Lück (1997), as they established a proven short scale of general job satisfaction.

As knowledge sharing is often not forced by an organization, it is seen as a proactive work behavior (Tuan, 2017). Hence, knowledge sharing should, to some extent, correlate with a proactive personality or personal initiative (Hon *et al.*, 2022). Hence, to further prove validity, proactivity was measured according to the construct of personal initiative by Frese *et al.* (1997). All used items are displayed in Appendix H.

RESULTS

Study 1: Distinguishing between motivation and behavior

It was derived from the theoretical model that KSM is substantially different from KSB.¹ This hypothesis was tested using factor analysis to determine whether and by how many latent factors this set of variables is underlain. An exploratory factor analysis using a varimax rotation that produces orthogonal factors was performed. It was expected that the components, i.e., motivation and behavior, are not correlated.

A correlation matrix for all items used to measure KSM and KSB was inspected and showed very mixed patterns of correlations (Appendix E). Nevertheless, assumptions for factor analysis are fulfilled (Bartlett’s test of sphericity, $p=0,00$; Kaiser-Meyer-Olkin measure of sampling adequacy, $KMO=0.88$)².

¹ Descriptive statistics for KSM are provided in Appendix C; descriptive statistics for items on behavior are provided in Appendix D.

² To test the appropriateness of factor analysis, the Stata package “factortest” by Joao Pedro Azevedo was used.

An initial exploratory factor analysis brought up four components (Kaiser criterion: eigenvalues higher than one). Horn's parallel analysis³ suggested extracting three factors. Appendix F shows the factor loadings of this analysis. Behavioral and motivational items do not overlap. Both constructs are selective. Hence, KSM and KSB can be distinguished as different components in the process of knowledge sharing.

Study 1: Scale of knowledge-sharing motivation

Data from Study 1 were analyzed using exploratory factor analysis to explore latent dimensions of KSM. As can be seen from Appendix C, all items suggested for measuring KSM vary to an acceptable extent and are not markedly different in their distribution. Therefore, they can be considered to be consistent (DeVellis, 2017, p. 143).

All but two items are intercorrelated highly enough. The two problematic items are the ones on (financial) rewards, which correlate strongly with each other but not significantly with all other items. However, there are no opposing correlations (positive and negative coefficients for one item at the same time) that would suggest inconsistency (DeVellis, 2017, p. 142). Therefore, it was chosen to keep the discussed items preliminarily on the scale. Assumptions for factor analysis are fulfilled (Bartlett's test of sphericity, $p=0.00$; KMO=0.89).

Exploratory factor analysis

In the first step, exploratory factor analysis was performed with all items suggested for measuring KSM to identify underlying dimensions. The general item on KSM (KSM1) was excluded from this analysis because it was designed as an overall measure. Items deviating from a normal distribution (KSM1, KSM2, KSM3, KSM4, KSM7, KSM8) and items with high

³ Parallel analysis produces eigenvalues adjusted for the sample error-induced inflation of factors. To perform parallel analysis in Stata, the package "paran" by Alexis Dinno was used.

values for uniqueness (low h^2) (KSM11, KSM13) were excluded. A factor analysis revealed three factors with eigenvalues higher than one (Kaiser criterion) underlying the KSM construct. However, the third factor has an eigenvalue only slightly above one (1.09). Although parallel analysis suggests extracting two factors, three factors were extracted here because the adjusted eigenvalue is rather close to the threshold (0.9).

Table 3: Factor loadings of knowledge-sharing motivation

Variable	Factor1	Factor2	Factor3	h^2
KSM10	0.7224	-0.0219	0.1524	0.5752
KSM14	0.6864	0.1441	-0.0041	0.6242
KSM6	0.6693	0.0867	-0.1242	0.5063
KSM16	-0.0033	0.7811	-0.0106	0.6039
KSM12	0.1010	0.6565	0.0819	0.5603
KSM15	0.2385	0.5277	-0.0503	0.4931
KSM9	-0.0512	0.0386	0.7770	0.5968
KSM5	0.0702	-0.0213	0.7605	0.6013

Principal factors, oblique promax, $N=343$.

Table 3 shows the rotated factor loadings (promax rotation). All items load selectively on a single factor and show reasonable factor loadings. The first factor consists of three items that refer to reputation, respect, and recognition as an expert and is therefore named “appreciation motivation.” The second factor consists of three items that refer to helping others and individual growth. This dimension is named “growth and altruism.” The third factor consists of two items on rewards and is named “tangible reward.” Therefore, a three-dimensional structure of KSM is suggested.

Study 2: Validation of the developed scale

Confirmatory factor analysis

In the second step, a confirmatory factor analysis using data from Study 2 was performed.⁴ Figure 3 shows a graphical representation of the first-order model built from the results of the EFA. Assumptions for factor analysis were met (Bartlett's test of sphericity: $p=0.00$; KMO=0.944), and no opposing item correlations exist (Appendix J).

Multivariate normality, as an assumption for the use of confirmatory factor analysis based on maximum likelihood estimation (MLE), was tested. The data did not meet this assumption. Therefore, MLE was used with a Satorra-Bentler correction of standard errors (Satorra and Bentler, 1994) and compared to results from an asymptotic distribution-free estimation (ADF) instead of MLE (Browne, 1984).

To assess the models, SRMR was examined, an absolute fit index that is less sensitive to sample size than other fit indices based on χ^2 . Furthermore, two non-centrality-based indices were reported (RMSEA, CFI). The estimated model shows a very good fit with all estimation methods (Table 4).

Table 4: Model fit

Fit index	MLE	MLE with Satorra-Bentler correction	ADF	threshold
RMSEA/RMSEA_SB	0.065	0.056	0.074	< 0.8
CFI/CFI_SB	0.972	0.975	0.911	> 0.9
SRMR	0.036	0.036	0.064	<0 .08

N=629.

When CFA was performed for the two samples (core administration and health sector) separately, the model fit was still good. In the core administration sample, all measures met the usual threshold (RMSEA=0.074, CFI=0.962 and SRMR=0.043) and, in the health sector sample, measures for model fit were even better (RMSEA=0.053, CFI=0.982, SRMR=0.038).

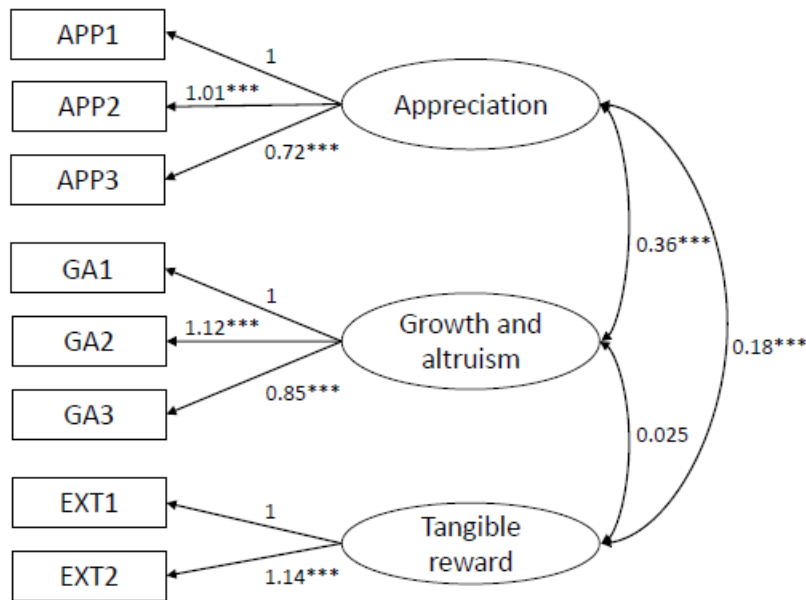
⁴ Descriptive statistics can be found in Appendix I.

Additionally, it was compared whether a single-factor model performed better in a CFA than the three-factor model. The difference in the two models' Akaikean and Bayesian information criteria was higher than the suggested thresholds: AIC three-factor model=12053.904; AIC single-factor model=12281.047, $\Delta AIC = 227.566$; BIC three-factor model=12173.895, BIC single-factor model=12387.706, $\Delta BIC = 213.811$.⁵ Accordingly, there was no support for the conclusion that the single-factor model works better than the three-factor model. Calculating the average variance extracted from each dimension showed that two factors met the recommended threshold (appreciation AVE=0.53, growth and altruism AVE=0.55), but had a value slightly too low for the third factor (extrinsic reward AVE=0.42). However, as AVE is a fairly conservative measure and the overall fit of the model was good, the value is still acceptable.

As can be seen from Figure 3, the first (appreciation) and second factors (growth and altruism) are interrelated in the model ($cov=0.36$, $p=0.00$). Other factor interrelations are not that pronounced (appreciation and tangible reward: $cov=0.18$, $p=0.00$) or even not significant (growth and altruism and tangible reward: $cov=0.025$, $p=0.37$). These results fit with the distinction between different kinds of extrinsic and intrinsic motivations found in self-determination theory (Deci and Ryan, 2008). Whereas “tangible reward motivation” forms the most controlled kind of extrinsic motivation (so-called “external regulation”), appreciation motivation is still extrinsic, but is a form of introjected regulation and thereby close to “growth and altruism,” which is intrinsically regulated. Thus, no mean index should be built from the items comprising the developed scale in further research.

Figure 3: Structural equation model of dimensions of KSM (ADF estimation, N=629).

⁵ AIC and BIC can only be calculated using MLE instead of ADF estimation.



Validation

To gauge the validity of the developed scale, a range of variables theoretically connected to KSM are included in the structural equation model (Table 5).

Table 5: Bivariate correlations of KSM and several measures

KSM dimension	KSM general (GEN1-4)	KSB mode (KSB1-4)	KSB proact. (KSB5-6)	KSB respons. (KSB7-8)	Job satisfaction	Proactivity
Appreciation	0.164 (0.09)	0.275 (0.020)	0.003 (0.979)	0.442 (0.002)	-0.160 (0.322)	0.004 (0.969)
Growth/altruism	0.727 (0.000)	0.255 (0.013)	0.552 (0.000)	0.230 (0.074)	-0.378 (0.039)	0.344 (0.000)
Tangible reward	-0.193 (0.001)	-0.061 (0.403)	0.075 (0.293)	-0.051 (0.538)	0.153 (0.037)	0.154 (0.001)

Asymptotic distribution free estimation, univariate models. Coefficients, p-values in parentheses, N=620.

All dimensions of the developed scale correlate partly with an overall measure for KSM. Therefore, the scale comprising three dimensions shows convergent validity and is useful for measuring KSM. The greatest influence on the four-item index of a general measure of KSM

comes from the dimension covering growth and altruism, and the motive covering tangible rewards has a negative influence on KSM (Table 5, column 2). At least in the used sample of public employees, “growth and altruism” is the best predictor for KSB measured by both the mode of sharing and its degree of proactiveness (Table 5, columns 2 and 3). Responsive KSB is better explained by appreciation (Table 5, column 4).

Different dimensions of the KSM construct do also correlate with related measures. It was expected that not every dimension would correlate with the related constructs in the same way, as they are theoretically different. Indeed, the data shows enough discriminant validity of the developed scale for KSM compared to related constructs (see Table 5).

To further assess discriminant validity, some demographic variables (age, gender, tenure, education level) that should not be correlated to KSM were analyzed (Appendix K). They were correlated pairwise with predicted factor scores for the dimensions of KSM. Neither of the analyzed variables was significantly correlated to one of the construct’s dimensions. This result further underlines the discriminant validity of the developed construct. The dimensional structure of KSM and its item wording can be found in Table 6.

Table 6: Dimensions of KSM and their item wording

Factor 1: appreciation	Factor 2: growth and altruism	Factor 3: tangible reward
If I share my work-related knowledge with my co-workers, I am perceived as an expert. (APP1)	If I share my work-related knowledge with my co-workers, I gain satisfaction from helping others to solve problems. (GA1)	If I share my work-related knowledge with my co-workers, it should also be rewarded. (EXT1)
... I enjoy acknowledgment and respect (APP2)	... I enjoy being able to help others with it. (GA2)	... I deserve a monetary reward. (EXT2)
... they acknowledge my expertise. (APP3)	... I personally grow and evolve. (GA3)	

Note: Items are presented in the order of their loadings in EFA.

DISCUSSION

It was the purpose of this paper to develop a construct to measure knowledge sharing in a way that distinguishes motivation from behavior. Exploratory factor analysis showed that KSM and KSB could clearly be distinguished as separate components. This result is congruent with the literature, where distinctions between knowledge-sharing attitude and behavior and between knowledge-sharing outcomes and motivation (Hung *et al.*, 2011) were found. This result also corresponds with the literature on motivation and work behavior in general (Kanfer, 2012). Thus, the results of this study show that the *pre- and post-actional stages* in the process of knowledge sharing can be distinguished. Therefore, they should be measured with different constructs in future. At the same time, motivation should also not be confused with an attitude towards knowledge sharing as a behavioral result.

By confirming that behavior and motivation are different constructs, it was revealed that a scale to measure KSM in a non-behavioral way was needed. As discussed in this article, no comprehensive and reproducible scale of KSM incorporating specific knowledge-sharing motives was available. Therefore, it was the purpose of this study to develop a scale measuring KSM in such a domain-specific way. Based on existing results about knowledge-sharing motives from the literature, a scale was constructed. This initial scale contained items referring to different motives for human behavior, namely relatedness as a social motive, achievement, growth and development, prosocial, and normative motives. An exploratory factor analysis derived three dimensions that can be described as appreciation motivation, growth motivation and altruism, and tangible reward motivation. These dimensions show high factor loadings and are distinctive, which indicates that construct validity and reliability have been achieved. This is confirmed by the results of a confirmatory factor analysis, which shows a good model fit. The resulting dimensions of KSM (appreciation, growth and altruism, and tangible rewards) fit

perfectly with Alderfer (1972), who claims that existence, relatedness, and growth (ERG-theory) are groups of needs that explain human behavior.

The *first factor* in KSM derived from the data refers to reputation, respect, and recognition as an expert as a motive for sharing knowledge. This “*appreciation motivation*” is identified as a form of extrinsic motivation (Deci and Ryan, 2008). The dimension covers instrumental (“seen as an expert”) and affective motives (“enjoy reputation and respect”). This dimension is very close to the basic motives of achievement and power and should not be confused with relationship or affiliation. Choi *et al.* (2020) recently found that appreciation by others enhances knowledge sharing intentions as well as positive attitudes towards knowledge sharing. However, they interpret appreciation not as a motive to share knowledge but rather as social pressures (if you want to be liked, you have to fulfill the norm). However, whether seen as external pressure or a motive, it becomes clear that the appreciation motive to knowledge sharing forms a rather extrinsic motivation that is closer to rewards than enjoyment, for example. Similarly, Nguyen *et al.* (2022) and Hosen *et al.* (2021) show that the enhancement of reputation significantly influences knowledge sharing.

The *second factor* refers to helping others by knowledge sharing and growing individually through this behavior. The dimension again covers affective motives. This “*growth and altruism motivation*” is a form of intrinsic motivation that is internally regulated and is the most autonomous form of motivation. This dimension comprises motives that are close to the basic motives of competence and autonomy (growth) (Ryan and Deci, 2000) as well as prosocial motives (altruism). Thereby, growth and appreciation (first factor) are theoretically very close. The theoretical proximity to the first factor is also represented by the high correlation between the two factors (Figure 3). However, growing individually is significantly different than being appreciated by others, because the latter depends (extrinsically) on others and goes back to the power motive. Individual growth is instead motivated intrinsically and does not

depend on other people. Furthermore, the first factor strictly points to success in career terms, while the second factor refers to the development of personality independent of the job. This developmental motive to share knowledge is also closely related to what Lin (2007) termed as self-efficacy to share knowledge

The prosocial part of this dimension is very close to what Hung *et al.* (2011) designed as the altruistic motivation to share knowledge and Olatokun and Nwafor (2012) as enjoyment in helping others. That motive of helping others was also identified as a determinant of knowledge sharing by Lin (2007). Similarly, Amayah (2013) found a (low) degree of empathy in an organization to be a barrier to knowledge sharing, which might be related to prosocial motives and helping behavior. The fact that altruism and growth load onto the same dimension fits with self-determination theory, as both motives are intrinsic. Furthermore, both refer to motives based on pleasure and enjoyment. Furthermore, Xia and Yang (2020) showed recently that such a prosocial motivation to share knowledge is an important precondition so that ethical leadership can foster knowledge sharing. Hence, leaders can actively build on such a motive to share knowledge and enhance it by serving as a role model.

The *third factor* covers instrumental motives (“financial remuneration”) and is close to the existence motive (Alderfer, 1972) as well as achievement and power-related motivation. Because the factor lacks items on job security and other existence-related measures, it was identified as “tangible reward” to underline this difference. There is also some similarity with the dimension “traction motivation” by Chen *et al.* (2012), but they include not only economic but also social exchange in this dimension. In this study, social exchange is instead a rationale for the dimension “appreciation.”

This third dimension is a form of externally regulated extrinsic motivation. Similarly, Amayah (2013) identified rewards as determinants of knowledge sharing in the public sector

context, as Lin (2007) did for the private sector. However, several studies also found no or even negative effects of rewards on knowledge sharing (e.g., Bock and Kim, 2001).

The fact that these items on rewards form a dimension of KSM in this study does not mean that this dimension is a booster of KSB. As it was shown by validating the scale, a negative correlation with a general measure of KSM and no or even negative effects on KSB were detected in this study. This fits with recent results of Gagné *et al.* (2019), who found extrinsically regulated motivation to be more highly correlated to knowledge hiding rather than sharing. However, Nguyen *et al.* (2021) suggested, that there might be a context effect in place concerning the impact of rewards. They showed extrinsic rewards to have a positive effect on knowledge sharing in private sector organizations, whereas in public sector organizations intrinsic motivators worked more effectively. However, Fischer (2021) found, that rewards – if at all – impact sharing of explicit knowledge but do not affect sharing of implicit knowledge. Hence, managerial actions aimed to foster certain motives to share knowledge should make sure that the right kind of knowledge-sharing behavior is targeted.

It is assumed that the constructed scale can be used regardless of the sampled organizations and is not sector-specific. This assumption is supported by the robust model fit in a very typical public sector sample (core public administration) as well as a sample, which is often characterized as fulfilling a public task in a private sector context (health care). However, the impact of each dimension of knowledge-sharing motivation on the subsequent behavior might differ according to the organizational context. For example, it can be assumed that altruism will have less influence on knowledge-sharing behavior, whereas rewards might have a stronger impact in the private sector.

Not all theoretically suggested dimensions could be confirmed with these data. This might be due to item wording, which might not have been strong or distinctive enough or might have caused socially desirable answering such that some items became skewed.

CONCLUSION

This study provides evidence on the distinction between KSM and KSB, which has to be considered in the measurement of KSM. The developed scale to measure KSM in this way contains three dimensions, and measures of construct validity and reliability have been reasonable.

These results contribute to the *literature on knowledge sharing* in three ways: First, the theoretical difference between motivation and behavior was confirmed empirically and should be recognized in the future as a strong argument against behavioral measures of KSM. Second, a scale to measure KSM without behavioral items was constructed transparently so that other researchers can use these efforts as a basis for their research. Third, KSM was constructed as a domain-specific motivation based on specific motives, which makes it easier to derive work designs or management interventions to foster KSB.

The distinction between KSM and KSB adds methodological support to the increasing use of experimental research as well as ethnographical studies, which are both able to capture performed behavior apart from self-reported motivation. This study underlines the need for distinguished measurement strategies for different stages in the process of human behavior. As social science research on the micro-level moves forward to more sophisticated methods, it is worth debating if the constructs in use measure what we want to measure or if they intermingle, for example, motivational and behavioral patterns.

This study also comes with limitations. Firstly, limitations may result from the research design. Respondents recruited themselves into the online panel and the sample. Results may be biased because respondents may already represent individuals with a strong motivation to share knowledge. Furthermore, surveys on the topic of knowledge sharing may suffer from social desirability and self-serving bias. Secondly, limitations derive from the context of this study. Some results might be due to the German public sector context. Thirdly, the factors occurring

from this analysis contain only two or three variables and should, therefore, be treated with caution. Future research should enhance the scale by testing further items.

These limitations and the steps of scale development accomplished in this study lead to suggestions for further research. *First* of all, the tested scale has to be further validated using other samples, ideally in different contexts and countries. Future research might concentrate particularly on the question of whether the constructed scale for measuring KSM in a public sector context is replicable in the private sector. *Second*, motives for knowledge sharing might have a different influence on KSB. For instance, Lam and Lambermont-Ford (2010) assume that extrinsic motivation supports the sharing of explicit knowledge, and intrinsic motivation fosters the sharing of implicit knowledge. Gagné (2009) also expects that while an intrinsic motivation to share knowledge “will likely lead to a high quantity of sharing, it may not necessarily lead to the most useful knowledge sharing” (574). Hence, scoring high on the “growth and altruism” dimensions of KSM might cause a lot of knowledge sharing that might not always be useful for the receiver. Individuals scoring high on the “appreciation” motive might examine the usefulness of their knowledge sharing because their colleagues may not appreciate their sharing. *Third*, based on these motives found for knowledge sharing, work designs and management interventions related to these motives should be tested to promote knowledge sharing. In this case, an experimental approach would be worthwhile.

According to Law and Ngai (2008), employees who are motivated to share their knowledge represent the most important precondition for knowledge management. It is important to know whether and how employees are motivated to share their knowledge to take steps to support and strengthen this motivation. However, comprehensive scales to identify the strength of employees’ KSM and their specific motives were missing so far. It is aimed to contribute to the literature by developing a valid scale measuring KSM.

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Appendix

A. Measures of KSM in the literature

Authors	Construct/dimensions	Items
Scales (at least partly) measuring behavior or intention		
Siemsen <i>et al.</i> (2008)	Motivation to share	I had no intention to share this knowledge with my co-worker. I was motivated to share what I know with my co-worker. I really wanted to share this knowledge with my co-worker.
Wei <i>et al.</i> (2008) *	Commitment to knowledge sharing	Internalization Identification Compliance
Fullwood <i>et al.</i> (2013)	Attitude towards knowledge sharing	I do not enjoy sharing my knowledge. Sharing my knowledge with other organizational members is valuable experience. Sharing my knowledge with other organizational members is a wise move. I share my knowledge in an appropriate and effective way.
Henttonen <i>et al.</i> , 2016	Knowledge-sharing propensity	At the end of each day, I feel that I have learned from other members from my organisation by exchanging and combining ideas. I am capable of sharing my expertise to bring new projects or initiatives to fruition. I am willing to exchange and combine ideas with their co-workers. It is rare for me to exchange and combine ideas to find solutions to problems.
Scales measuring an ‘attitude towards knowledge sharing’ resulting from the behavior		
Bock and Kim (2001)	Attitude towards knowledge sharing	My knowledge sharing with other organizational members is good. My knowledge sharing with other organizational members is harmful. My knowledge sharing with other organizational members is an enjoyable experience. My knowledge sharing with other organizational members is valuable to me. My knowledge sharing with other organizational members is a wise move.
Agyemang <i>et al.</i> (2016)	Attitude towards knowledge sharing	If I share my knowledge with other teachers, I feel very beneficial. If I share my knowledge with other teachers, I feel very pleasant. If I share my knowledge with other teachers, I feel very meaningful. It is a wise move if I share my knowledge with my co-workers.
Choi (2020)	Attitude toward knowledge sharing	My knowledge sharing with other developers is good. My knowledge sharing with other developers is valuable. My knowledge sharing with other developers is beneficial.
Models of KSM without measurement items		
Gagné (2009)		
Lam and Lambermont-Ford (2010)		
Law <i>et al.</i> (2017)		
Scales measuring motivation		
Lin <i>et al.</i> (2007)	Expected organizational rewards	I will receive a higher salary in return for my knowledge sharing.

Hung <i>et al.</i> (2011)	Reciprocal benefits	I will receive a higher bonus in return for my knowledge sharing.
		I will receive increased promotion opportunities in return for my knowledge sharing.
		I will receive increased job security in return for my knowledge sharing.
		I strengthen ties between existing members of the organization and myself.
		I expand the scope of my association with other organization members.
	Knowledge self-efficacy	I expect to receive knowledge in return when necessary.
		I believe that my future requests for knowledge will be answered.
		I am confident in my ability to provide knowledge that others in my organization consider valuable.
		I have the expertise required to provide valuable knowledge for my organization.
		It does not really make any difference whether I share my knowledge with colleagues.
	Enjoyment in helping others	Most other employees can provide more valuable knowledge than I can. (Reverse coded)
		I enjoy sharing my knowledge with colleagues.
		I enjoy helping colleagues by sharing my knowledge.
		It feels good to help someone by sharing my knowledge.
		Sharing my knowledge with colleagues is pleasurable.
Altruism	I enjoy sharing my knowledge with others through a group meeting.	
	I enjoy helping others by sharing my knowledge through a group meeting.	
	It feels good to help someone else by sharing my knowledge through a group meeting.	
	Sharing my knowledge with others through a group meeting gives me pleasure.	
	Reciprocity	When I share my knowledge through a group meeting, I believe that I will get an answer when I give an answer.
		When I share my knowledge through a group meeting, I expect somebody to respond when I'm in need.
		When I contribute knowledge to a group meeting, I expect to get back knowledge when I need it.
Gu and Gu (2011) *	Existence motivation	Increased Salary/bonus
		Receive reward
		Enhance job security
	Relationship motivation	Hold group membership
		Recognized expertise
		Get status as expert
		Reputation and esteem
	Growth motivation	Learning more knowledge and growth and development
		Achievement
	Norm motivation	Good feeling from sharing knowledge
		Responsibility to share
		Knowledge as a public good, shared by people
Reinholt <i>et al.</i> (2011)	Intrinsic motivation	Knowledge belongs to organizations rather than to individuals.
		Why do you share knowledge? ... because I enjoy it
	Identified motivation	... because I like it.
		... because I find it personally satisfying.
		... because I think it is an important part of my job.

	Controlled motivation	... It may help me get promoted.
		... I want my supervisor(s) to praise me.
		... I want my colleague(s) to praise me.
		... I want to avoid negative reactions from the head of my department.
		... I might get a reward.
Chen <i>et al.</i> (2012)	Traction motivation	I will receive monetary rewards in return for my knowledge sharing.
		I will receive additional rewards in return for me sharing knowledge.
		When I share my knowledge through this virtual community, I expect somebody to respond when I'm in need.
	Relation motivation	My knowledge sharing would get me well acquainted with new members in this virtual community.
		My knowledge sharing would strengthen the ties between existing members in this virtual community and myself.
		My knowledge sharing would expand the scope of my association with other members in this virtual community.
	Interest motivation	My knowledge sharing would increase productivity in this virtual community.
		My knowledge sharing would draw willing cooperation from existing members in the future.
		My knowledge sharing would help this virtual community achieve its performance objectives.
Andreeva and Sergeeva (2016)	Intrinsic motivation to share knowledge	I like sharing knowledge.
		I think sharing knowledge is an important part of my job.
		I find it personally satisfying.
	Extrinsic motivation to share knowledge	I share knowledge because I want my supervisor to praise me.
		I share knowledge because I want get a reward.
Llopis and Foss (2016)	Intrinsic motivation to share knowledge	I share knowledge because it might help me get promoted.
		I find it personally satisfying.
		I enjoy doing so.
		I like sharing knowledge.
Stenius <i>et al.</i> (2017)	Autonomous motivation to share knowledge	... because I enjoy it.
		... because it is an important part of my job.
Gagné <i>et al.</i> (2019)	External regulation	I share my knowledge with colleagues at work...
		... because I risk losing my job if I don't share my knowledge.
		... to avoid being criticized by others.
	Introjected regulation	... because sharing my knowledge makes me feel more important.
		... because others will respect me more.
	Autonomous Motivation	... because I think it is very important for me to share what I know with my colleagues.
		... because it makes my team, unit or organization more successful, and this is very important to me.
		... because it is fun to talk about things I know.
		... because I enjoy talking about things that I feel passionate about.

* no concrete wording available, even on request.

B. Operationalization Table (Study 1)

Variables Items	Scale
Knowledge-sharing motivation	
<i>Overall measure</i>	5-point Likert scale
I like to share my work-related knowledge. (KSM 1)	(1=Strongly disagree, ... 5=Strongly agree)
<i>Relationship motivation</i>	
If you share your knowledge with co-workers, you are appreciated. (KSM 2)	
If you share your knowledge with co-workers, your know-how will be recognized. (KSM 6)	
If you share your knowledge with co-workers, you will be seen as an expert. (KSM 10)	
If you share your knowledge with co-workers, you enjoy reputation and respect. (KSM 14)	
<i>Achievement motivation</i>	
If you share your knowledge with co-workers, you deserve financial remuneration. (KSM 5)	
If somebody shares his/her knowledge with co-workers, it should be rewarded. (KSM 9)	
If you share your knowledge with co-workers, you increase your job security. (KSM 13)	
<i>Growth motivation (Gu and Gu, 2011)</i>	
If I share my knowledge it constitutes success for me. (KSM 4)	
If you share your knowledge you grow individually and undergo personal development. (KSM 15)	
I feel good when I am able to share my knowledge. (KSM 8)	
<i>Norm motivation</i>	
To share your own knowledge with co-workers is part of a good task fulfillment. (KSM 3)	
Knowledge is a public good which should be shared by everybody. (KSM 7)	
My work-related knowledge does not belong to me alone but to my organization. (KSM 11)	
<i>Altruism (Hung et al., 2011)</i>	
Through sharing knowledge, I enjoy helping others. (KSM 12)	
It fills me with joy to help others solve problems. (KSM 16)	
Knowledge-sharing behavior (Bock and Kim, 2001)	
How often do you share the following types of information with your co-workers:	7-point scale
... Reports and official documents like a record? (KSB 1)	(reverse coded: 7=Several times a day, 6=Once a day, 5=Several times a week, 4=Once a week, 3=Several times a month, 2=Once a month, 1=Less than once a month, 0=Never)
... Instructions or guidelines for certain tasks? (KSB 2)	
... Which co-worker can be asked regarding certain topics? (KSB 3)	
... Where or how to find information? (KSB 4)	
... Your own experience of getting tasks done? (KSB 5)	
... Your own experience of avoiding problems while completing tasks? (KSB 6)	
... Information you gathered during an apprenticeship or other training programs? (KSB 7)	
Tenure	
How many years of work experience do you have?	Continuous (0=Less than one year, 1, ... 55 years)
Career path	
Public service career path configured from: To which public service pay grade do you belong? (open-ended)	1=Basic/intermediate service 2=Executive service 3=Higher service
Supervisory status	
Do you have a supervisory status?	1=Yes 0=No
Highest level of education	
What is the highest level of education you have completed?	1=School graduation 2=Vocational education 3=Bachelor's degree 4=Master's degree/diploma/state
(note: answers from the open answer option (N=10) were coded and sorted into the classification)	

	examination 5=PhD/doctorate
Age	
How old are you?	Continuous (18, ... 80 years)
Gender	
What is your gender?	1=Female respondent 0=Male respondent

A. Descriptive statistics and correlation matrix of knowledge-sharing motivation (Study 1)

	N	Mean	SD	Min	Max	KSM1	KSM2	KSM3	KSM4	KSM5	KSM6	KSM7	KSM8	KSM9	KSM10	KSM11	KSM12	KSM13	KSM14	KSM15	KSM16
KSM1	354	4.45	0.77	1	5	1															
KSM2	353	4.32	0.80	1	5	0.63*	1														
KSM3	354	4.45	0.73	1	5	0.71*	0.67*	1													
KSM4	353	4.18	0.84	1	5	0.59*	0.53*	0.58*	1												
KSM5	352	3.07	1.19	1	5	-0.05	-0.02	-0.03	0.16*	1											
KSM6	352	4.09	0.87	1	5	0.49*	0.52*	0.53*	0.56*	0.11*	1										
KSM7	353	4.20	0.82	1	5	0.48*	0.31*	0.39*	0.38*	0.1*	0.4*	1									
KSM8	353	4.29	0.79	1	5	0.61*	0.5*	0.52*	0.6*	0.15*	0.62*	0.55*	1								
KSM9	351	3.42	1.07	1	5	-0.05	0.00	-0.03	0.10*	0.7*	-0.01	0.06	0.08	1							
KSM10	351	3.63	0.96	1	5	0.28*	0.38*	0.31*	0.39*	0.31*	0.54*	0.30*	0.47*	0.24*	1						
KSM11	351	3.75	1.05	1	5	0.35*	0.33*	0.34*	0.35*	-0.03	0.39*	0.41*	0.37*	-0.04	0.35*	1					
KSM12	350	4.02	0.85	1	5	0.45*	0.37*	0.35*	0.53*	0.2*	0.43*	0.45*	0.57*	0.17*	0.44*	0.42*	1				
KSM13	349	3.30	1.09	1	5	0.24*	0.27*	0.2*	0.28*	0.23*	0.31*	0.28*	0.32*	0.16*	0.40*	0.38*	0.43*	1			
KSM14	352	3.83	0.89	1	5	0.33*	0.45*	0.34*	0.43*	0.19*	0.57*	0.32*	0.46*	0.13*	0.65*	0.35*	0.48*	0.54*	1		
KSM15	352	4.08	0.83	1	5	0.5*	0.42*	0.47*	0.46*	0.13*	0.50*	0.43*	0.56*	0.1*	0.41*	0.41*	0.49*	0.42*	0.53*	1	
KSM16	352	4.17	0.83	1	5	0.44*	0.34*	0.32*	0.42*	0.13*	0.38*	0.42*	0.55*	0.11*	0.40*	0.37*	0.64*	0.42*	0.51*	0.59*	1

* $p < 0.1$

B. Descriptive statistics of knowledge-sharing behavior (Study 1)

<i>Item</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
<i>How often do you share reports and official documents like a record with your co-workers? (KSB1)</i>	326	4.29	2.34	0	7
<i>How often do you share instructions or guidelines for certain tasks with your co-workers? (KSB2)</i>	324	2.88	2.10	0	7
<i>How often do you share which co-worker can be asked regarding certain topics with your co-workers? (KSB3)</i>	326	4.22	2.10	0	7
<i>How often do you share where or how to find information with your co-workers? (KSB4)</i>	323	4.45	1.92	0	7
<i>How often do you share your own experience of getting tasks done with your co-workers? (KSB5)</i>	326	4.33	1.92	0	7
<i>How often do you share your own experience of avoiding problems while completing tasks with your co-workers? (KSB6)</i>	326	2.79	2.03	0	7
<i>How often do you share information you gathered during an apprenticeship or other training program with your co-workers? (KSB7)</i>	326	4.29	2.34	0	7

C. Correlation matrix of knowledge-sharing motivation and behavior (Study 1)

	KSM 1	KSM 2	KSM 3	KSM 4	KSM 5	KSM 6	KSM 7	KSM 8	KSM 9	KSM 10	KSM 11	KSM 12	KSM 13	KSM 14	KSM 15	KSM 16	KSB 1	KSB 2	KSB 3	KSB 4	KSB 5	KSB 6	KSB 7
KSB 1	-0.06	-0.08	-0.02	-0.12*	-0.17*	-0.07	-0.11*	-0.03	-0.10*	-0.09	-0.09	-0.10*	-0.15*	-0.09*	-0.07	-0.08	1						
KSB 2	-0.09*	-0.14*	-0.07	-0.13*	-0.12*	-0.15*	-0.09*	-0.13*	-0.09	-0.13*	-0.17*	-0.13*	-0.22*	-0.13*	-0.13*	-0.13*	0.45*	1					
KSB 3	-0.07	-0.09*	-0.07	-0.13*	-0.03	-0.18*	-0.12*	-0.18*	-0.01	-0.14*	-0.14*	-0.13*	-0.22*	-0.19*	-0.20*	-0.26*	0.36*	0.46*	1				
KSB 4	-0.04	-0.13*	-0.04	-0.05	-0.06	-0.06	-0.09	-0.14*	0.00	-0.11*	-0.11*	-0.03	-0.18*	-0.15*	-0.14*	-0.14*	0.37*	0.49*	0.62*	1			
KSB 5	-0.05	-0.09*	-0.01	-0.01	0.07	-0.07	-0.12*	-0.14*	0.04	-0.07	-0.15*	-0.09	-0.14*	-0.11*	-0.16*	-0.11*	0.28*	0.47*	0.48*	0.61*	1		
KSB 6	-0.06	-0.09	-0.05	-0.03	0.03	-0.09	-0.09*	-0.11*	0.05	-0.08	-0.14*	-0.11*	-0.17*	-0.10*	-0.17*	-0.12*	0.26*	0.49*	0.50*	0.54*	0.78*	1	
KSB 7	-0.05	-0.13*	-0.09	-0.05	-0.08	-0.13*	-0.14*	-0.09*	-0.06	-0.10*	-0.14*	-0.14*	-0.23*	-0.16*	-0.18*	-0.14*	0.19*	0.36*	0.37*	0.45*	0.52*	0.51*	1

* $p < 0.1$

D. Factor loadings of knowledge-sharing motivation and behavior

Variable	Factor1	Factor2	Factor3	h ²
KSM8	0.7916	-0.0651	0.0910	0.6392
KSM1	0.7760	-0.0045	-0.1959	0.6406
KSM3	0.7282	0.0342	-0.1802	0.5639
KSM6	0.7212	-0.0697	0.0619	0.5288
KSM4	0.7054	-0.0100	0.0939	0.5064
KSM15	0.6973	-0.1272	0.0908	0.5106
KSM2	0.6819	-0.0877	-0.0851	0.4799
KSM12	0.6798	-0.0765	0.2641	0.5377
KSM 4	0.6474	-0.0910	0.2979	0.5162
KSM16	0.6433	-0.1087	0.1592	0.451
KSM7	0.6047	-0.0569	0.0875	0.3766
KSM10	0.5763	-0.0675	0.3851	0.485
KSM11	0.5272	-0.1570	0.0315	0.3036
KSM13	0.4252	-0.2088	0.3239	0.3293
KSB5	-0.0305	0.8277	0.0956	0.6951
KSB6	-0.0493	0.8042	0.0593	0.6527
KSB4	-0.0371	0.7578	-0.0410	0.5773
KSB3	-0.1172	0.6645	-0.0580	0.4587
KSB3	-0.0942	0.6243	-0.1541	0.4224
KSB7	-0.0988	0.5653	-0.0670	0.3339
KSB1	-0.0386	0.4264	-0.1982	0.2226
KSM5	0.0623	0.0242	0.7662	0.5916
KSM9	-0.0014	0.0376	0.7024	0.4948
Var. expl. (%)	51.19	27.78	14.14	

Principal factors, orthogonal varimax, N=309.

E. Item-scale correlation of knowledge-sharing motivation (Study 1)

<i>Item</i>	<i>N</i>	<i>Item-rest corr.</i>	<i>alpha</i>
<i>I like to share my work-related knowledge. (KSM1)</i>	338	0.6093	0.8803
<i>If you share your knowledge with co-workers, you are appreciated. (KSM2)</i>	338	0.5927	0.8806
<i>To share your own knowledge with co-workers is part of a good task fulfillment. (KSM3)</i>	338	0.5710	0.8818
<i>If I share my knowledge it constitutes success for me. (KSM4)</i>	338	0.6689	0.8777
<i>If you share your knowledge with co-workers, you deserve financial remuneration. (KSM5)</i>	338	0.2296	0.8987
<i>If you share your knowledge with co-workers, your know-how will be recognized. (KSM6)</i>	338	0.6537	0.8780
<i>Knowledge is a public good which should be shared by everybody. (KSM7)</i>	338	0.5402	0.8824
<i>I feel good when I am able to share my knowledge. (KSM8)</i>	338	0.7267	0.8761
<i>If somebody shares his/her knowledge with co-workers, it should be rewarded. (KSM9)</i>	338	0.1913	0.8980
<i>If you share your knowledge with co-workers, you will be seen as an expert. (KSM10)</i>	338	0.6211	0.8791
<i>My work-related knowledge does not belong to me alone but to my organization. (KSM11)</i>	338	0.4896	0.8849
<i>Through sharing my knowledge, I enjoy helping others. (KSM12)</i>	338	0.6944	0.8766
<i>If you share your knowledge with co-workers, you increase your job security. (KSM13)</i>	338	0.5057	0.8843
<i>If you share your knowledge with co-workers, you enjoy reputation and respect. (KSM14)</i>	338	0.6608	0.8777
<i>If you share your knowledge, you grow individually and undergo personal development. (KSM15)</i>	338	0.6615	0.8781
<i>It fills me with joy to help others solve problems. (KSM16)</i>	338	0.6231	0.8795
<i>Test scale</i>			0.8888

F. Operationalization Table (Study 2)

Variables Items	Scale
Knowledge-sharing motivation	
<i>Appreciation</i>	5-point Likert scale
If I share my work-related knowledge with my co-workers, ...	
... I am perceived as an expert. (APP1)	(1=Strongly disagree, ...
... I enjoy acknowledgment and respect (APP2)	5=Strongly agree)
... they acknowledge my expertise. (APP3)	
<i>Growth and altruism</i>	
If I share my work-related knowledge with my co-workers, ...	
... I gain satisfaction from helping others to solve problems. (GA1)	
... I enjoy being able to help others with it. (GA2)	
... I personally grow and evolve. (GA3)	
<i>Tangible reward</i>	
If I share my work-related knowledge with my co-workers, ...	
... it should also be rewarded. (EXT1)	
... I deserve a monetary reward. (EXT2)	
<i>General measure</i>	
Overall, I am willing to share my work-related knowledge with my co-workers. (GEN1)	
I enjoy sharing my work-related knowledge with my co-workers. (GEN2)	
It is part of my job to share my work-related knowledge with my co-workers. (GEN3)	
I share my work-related knowledge with my co-workers because it is customary in my team. (GEN4)	
Knowledge-sharing behavior	
<i>Preferred mode of sharing knowledge</i>	5-point Likert scale
I share my work-related knowledge...	
... in personal dialogues with individual people. (KSB1)	(1=not true at all, ...
... in personally written communication (e.g. letter, e-mail, chats) with individual people. (KSB2)	5=very true)
... in written form in files, reports and databanks. (KSB3)	
... orally in team meetings or other forms of group discussions. (KSB4)	
<i>Proactive and responsive behavior</i>	
I share my work-related knowledge...	
... if I am asked to do so by my co-workers. (KSB5)	
... if a manager asks me to do so. (KSB6)	
... without have been asked. (KSB7)	
... if I have learned something new. (KSB8)	
Job satisfaction	
I hardly enjoy my work but you shouldn't expect too much.	5-point Likert scale
I fully enjoy my work.	
I am in a rut with my job and nothing can be changed about that.	(1=not true at all, ...
My job offers me enough opportunities to use my abilities.	5=very true)
I am satisfied with the career prospects offered.	
If I were to choose again, I would do the same job over again.	
Personal initiative	
I actively attack problems.	5-point Likert scale
Whenever something goes wrong, I search for a solution immediately.	
Whenever there is a chance to get actively involved, I take it.	(1=not true at all, ...
I take initiative immediately even when others don't.	5=very true)
I use opportunities quickly in order to attain my goals.	
Usually, I do more than I am asked to do.	
I am particularly good at realizing ideas.	
Tenure	
How many years of work experience do you have?	Continuous (0=Less than one year, 1, ... 55 years)

Career path	
Public service career path configured from: To which public service pay grade do you belong? (open-ended)	1=Basic/Intermediate service 2=Executive service 3=Higher service
Supervisory status	
Do you have a supervisory status?	1=Yes 0=No
Highest level of education	
What is the highest level of education you have completed?	1=School graduation 2=Vocational education 3=Bachelor's degree 4=Master's degree/diploma/state examination 5=PhD/doctorate
Age	
How old are you?	Continuous (18, ... 80 years)
Gender	
What is your gender?	1=Female respondent 0=Male respondent

G. Descriptive statistics (Study 2)

Variable	N	Mean	SD	Min	Max
APP1	629	3.37	0.97	1	5
APP2	629	3.72	0.86	1	5
APP3	629	4.05	0.79	1	5
GA1	629	4.08	0.83	1	5
GA2	629	3.78	0.89	1	5
GA3	629	3.89	0.90	1	5
EXT1	629	3.17	1.15	1	5
EXT2	629	2.10	1.12	1	5
GEN1	628	4.13	0.79	1	5
GEN2	629	3.95	0.90	1	5
GEN3	629	3.72	1.05	1	5
GEN4	628	3.98	0.88	1	5
KSB1	629	4.14	0.77	1	5
KSB2	629	2.83	1.26	1	5
KSB3	629	2.84	1.20	1	5
KSB4	629	3.55	1.09	1	5
KSB5	629	4.18	0.87	1	5
KSB6	629	3.64	1.18	1	5
KSB7	629	3.43	1.06	1	5
KSB8	629	3.74	0.95	1	5
job-sat1	622	2.19	1.11	1	5
job-sat2	622	3.63	0.98	1	5
job-sat3	622	2.59	1.10	1	5
job-sat4	621	3.80	0.90	1	5
job-sat5	621	3.77	0.94	1	5
job-sat6	622	3.02	1.17	1	5
job-sat7	621	3.87	0.91	1	5
job-sat8	622	3.53	1.18	1	5
proactive1	622	3.97	0.77	1	5
proactive2	622	4.06	0.75	1	5
proactive3	622	3.78	0.81	1	5
proactive4	622	3.42	0.91	1	5
proactive5	622	3.63	0.81	1	5
proactive6	622	3.75	0.88	1	5
proactive7	622	3.70	0.80	1	5

H. Correlation matrix of knowledge-sharing motivation and behavior (Study 2)

	APP1	APP2	APP3	GA1	GA2	GA3	EXT1	EXT2	GEN1	GEN2	GEN3	GEN4	KSB1	KSB2	KSB3	KSB4	KSB5	KSB6	KSB7	KSB8
APP1	1																			
APP2	0.58***	1																		
APP3	0.42***	0.54***	1																	
GA1	0.37***	0.54***	0.42***	1																
GA2	0.45***	0.58***	0.38***	0.64***	1															
GA3	0.33***	0.43***	0.40***	0.50***	0.48***	1														
EXT1	0.24***	0.18***	0.10*	0.00	0.07	0.05	1													
EXT2	0.28***	0.18***	0.04	-0.01	0.03	0.04	0.42***	1												
GEN1	0.34***	0.43***	0.37***	0.59***	0.51***	0.44***	-0.07	-0.09*	1											
GEN2	0.38***	0.49***	0.40***	0.63***	0.58***	0.43***	-0.02	-0.04	0.75***	1										
GEN3	0.24***	0.30***	0.25***	0.32***	0.26***	0.29***	-0.05	0.02	0.48***	0.46***	1									
GEN4	0.25***	0.35***	0.25***	0.35***	0.35***	0.30***	-0.02	-0.04	0.51***	0.49***	0.51***	1								
KSB1	0.30***	0.36***	0.30***	0.42***	0.40***	0.32***	0.01	-0.05	0.50***	0.49***	0.27***	0.37***	1							
KSB2	0.22***	0.17***	0.08*	0.15***	0.19***	0.13***	0.05	0.16***	0.13**	0.15***	0.13**	0.11**	0.21***	1						
KSB3	0.20***	0.21***	0.13**	0.17***	0.15***	0.18***	0.11**	0.20***	0.18***	0.15***	0.22***	0.17***	0.20***	0.54***	1					
KSB4	0.28***	0.32***	0.22***	0.28***	0.24***	0.28***	0.07	0.09*	0.36***	0.33***	0.30***	0.33***	0.3***	0.30***	0.34***	1				
KSB5	0.25***	0.32***	0.30***	0.35***	0.30***	0.24***	0.06	0.01	0.47***	0.43***	0.28***	0.35***	0.46***	0.11**	0.13***	0.29***	1			
KSB6	0.22***	0.25***	0.21***	0.18***	0.20***	0.21***	0.14***	0.04	0.19***	0.22***	0.19***	0.23***	0.22***	0.14***	0.20***	0.30***	0.43***	1		
KSB7	0.25***	0.26***	0.27***	0.28***	0.27***	0.27***	0.02	0.08	0.40***	0.36***	0.31***	0.25***	0.33***	0.27***	0.29***	0.25***	0.19***	0.11**	1	
KSB8	0.28***	0.34***	0.28***	0.43***	0.36***	0.37***	0.04	0.02	0.50***	0.48***	0.41***	0.34***	0.37***	0.20***	0.26***	0.41***	0.37***	0.21***	0.50***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

K. Bivariate correlations of KSM dimensions and demographics

KSM dimension	age	gender	tenure	education level
Appreciation	0.044 (0.461)	-0.024 (0.564)	0.021 (0.726)	0.091 (0.028)
Growth/altruism	0.081 (0.173)	0.045 (0.286)	-0.042 (0.479)	0.050 (0.229)
Tangible reward	-0.030 (0.617)	-0.066 (0.115)	0.048 (0.414)	0.076 (0.067)

Pairwise beta coefficients, p-values in parentheses, N=604.