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'Let's share!' The mediating role of employees' self-determination in the relationship between transformational and shared leadership and perceived knowledge sharing among peers

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ABSTRACT

Building on social-exchange and self-determination theory, this study aimed to contribute to the scholarly literature on leadership and knowledge sharing by simultaneously testing how shared and transformational leadership and their interrelatedness may foster employees' perceptions of knowledge sharing behaviour among peers. Additionally, we investigated the mediating role of employees' basic psychological needs satisfaction (in terms of autonomy, competence and relatedness, respectively) as an additional explanatory mechanism to reveal how shared and transformational leadership may foster individuals' perceptions of knowledge sharing behaviour among peers. We employed PLS structural equation modelling to analyse survey data obtained from professionals in an R&D unit of a knowledge-intensive firm. We found shared leadership to be the most important factor enhancing employees' perceptions of knowledge sharing among peers, both directly and indirectly through employees' satisfaction of the need for autonomy. Transformational leadership was found to foster employees' knowledge sharing ultimately, through shared leadership and the need for autonomy satisfaction. We concluded that shared forms of leadership supplemented with transformational leadership on the part of formal leaders are important in contemporary work environments as they can foster employees' perceptions of knowledge sharing among peers and contribute towards employees' self-determination, which ultimately enhances perceptions of knowledge sharing among peers.

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1. Introduction

Influenced by trends such as globalisation, individualisation and flexibilisation, contemporary workplace designs are increasingly characterised by a decentralisation of decision-making authority and responsibilities, reflected in more professional autonomy, teamwork and management by objectives, running parallel with enhanced flexibility (cf. Peters, Den Dulk, & Van der Lippe, 2009; Spreitzer, Cameron, & Garret, 2017). These workplace redesigns may be driven by organisations' needs to address increasingly complex problems, something that demands diverse knowledge, skills and expertise on the part of professionals who have to collectively develop creative and innovative solutions (Alsharo,

Gregg, & Ramirez, 2017).

Collective problem solving, including developing and promoting new ideas and implementing procedures, requires knowledge sharing, which refers to the provision of task information and know-how to help others and collaborate with others (Cummings, 2004). Some scholars are optimistic about the positive effects of these contemporary work designs on employee knowledge sharing (e.g. Alsharo et al., 2017; Llopis & Foss, 2016; Mueller, 2014). However, others have reported insufficient collaboration and lower levels of knowledge sharing (e.g. De Paoli & Ropo, 2015; O'Neill, Hambley, & Chatellier, 2014).

Particularly, in knowledge-intensive industries and R&D units, where employees from various disciplines and backgrounds are involved in dispersed and temporary teams, fragmentation of information can inhibit knowledge sharing among peers who have to collaborate (Coradi, Heinzen, & Boutellier, 2015; Mabey & Zhao, 2017). Knowledge sharing among peers may be disturbed because

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employees do not know who has relevant expertise or because they are not motivated to contribute more than only job-related information (Ellison, Gibbs, & Weber, 2015). Moreover, employees might be unwilling to share information because of perceptions of loss of personal power or knowledge ownership. If knowledge is not shared, the cognitive resources that are available within a team or an organisation remain underutilised (Argote & Ingram, 2000). It is generally agreed that knowledge sharing does not occur automatically: Employees have to be stimulated to proactively exchange knowledge and information, which is dependent on their willingness to share knowledge with peers (Lagerström & Andersson, 2003). Furthermore, the readiness to share knowledge can be promoted when employees also expect and perceive others to share knowledge. Studies have shown that in addition to job design, the interpretation of the role of leadership affects employees' motivation (Gagné, 2009; De Cooman, Stynen, Van den Broeck, Sels, & De Witte, 2013). Therefore, the question may be asked which form of leadership is effective in terms of creating perceptions of knowledge sharing among peers and what constitutes the underlying mechanisms.

There is some empirical evidence that shared leadership is positively associated with knowledge sharing (Han, Lee, Beyerlein, & Kolb, 2018; Lee, Lee, Seo, & Choi, 2015). The concept of shared leadership implies that individual employees jointly take responsibility for activities that used to be undertaken by formal leaders, by sharing these among each other and by influencing others through interaction (Carson, Tesluk, & Marrone, 2007; Pearce, 2004). As a result of social exchange (Blau, 1964), shared responsibility may foster employees' mutual trust, which not only enhances their readiness to share their expertise and the knowledge required for the proper performance of complex and innovative work activities together with their colleagues but also their perceptions of their knowledge sharing behaviour being reciprocated. Hence, we need to investigate further if and how shared leadership may positively affect knowledge sharing among peers.

In addition, it can be argued that shared leadership does not eliminate the role of a formally appointed (team) leader (Coun, Gelderman, & Perez, 2015). Instead of directing and controlling their employees, formal leaders have a role in supporting and developing shared leadership by coaching, inspiring and stimulating informal collaboration among employees (Hoch, 2013; Pearce, 2004). These characteristics fit well with a transformational leadership style (e.g. Bass, 1990; Purvanova & Bono, 2009). There is some empirical evidence that transformational leadership encourages the development of shared leadership (Hoch, 2013). In a similar vein, the knowledge sharing literature has shown that transformational leadership is also an important predictor of knowledge sharing (e.g. Han, Seo, Li, & Yoon, 2016; Srivastava, Bartol, & Locke, 2006; Xiao, Zhang, & Ordóñez de Pablos, 2017). Therefore, transformational leadership on the part of a formally appointed leader might play a role both in enhancing shared leadership and in directly fostering knowledge sharing. Although the knowledge sharing literature has greatly expanded over the past decade (e.g. Dong, Bartol, Zhang, & Li, 2017; Kang & Lee, 2017; Wang & Noe, 2010), empirical research on the role of and the interrelationship between transformational and shared leadership in relation to knowledge sharing among peers has remained scarce.

In understanding how both shared and transformational leadership may contribute to knowledge sharing with peers, self-determination theory (SDT) (Deci & Ryan, 2000) might be a useful theoretical lens. SDT emphasises that the satisfaction of three basic psychological needs (autonomy, competence and relatedness) plays a role in the process of growth and development towards self-determination. When people feel that their basic psychological

needs are satisfied, they become self-determined and may be expected to enjoy sharing their knowledge to a greater extent (Gagné, 2009). Shared leadership and transformational leadership demonstrated by a formal leader might influence the self-determination of employees, which, in turn, stimulates individual employees not only to have trust in other fellow employees when it comes to sharing knowledge but also to perceive that knowledge sharing with peers in the organisation will be reciprocated. There is some empirical evidence that transformational leadership may promote employees' basic psychological needs satisfaction (PNS) and, in turn, enhance job satisfaction and work engagement (Hetland et al., 2015; Kovjanic, Schuh, & Jonas, 2013). However, research that examines how self-determination translates into employees' perceptions of knowledge sharing behaviour among peers is scarce. To the best of our knowledge, no studies have investigated the role of shared leadership in promoting employees' basic PNS and how this, in turn, might impact employees' perceptions of knowledge sharing behaviour among peers. In view of the literature gaps discussed above, the aim of the present research is to investigate how both shared and transformational leadership may directly contribute to employees' perceptions of knowledge sharing behaviour among peers, or may do so indirectly through employees' basic PNS.

The contribution of the present study is threefold. First, it extends previous research on knowledge sharing by examining the role of both shared and transformational leadership in fostering knowledge sharing behaviour among peers. This is done by focusing on the mechanism of social exchange. Second, our study enhances knowledge on the role of leadership in knowledge sharing by examining the influence of transformational leadership on the development of shared leadership and by examining the interrelatedness between the two styles, which, in turn, creates a climate of knowledge sharing. We emphasise the importance of developing a better understanding of the changing role of leadership in knowledge sharing in contemporary workplaces. Finally, our study extends the literature on knowledge sharing by examining the (mediating) role of employees' self-determination as an explanatory mechanism to reveal how transformational and shared leadership might foster employees' knowledge sharing among peers.

2. Theory and hypotheses

2.1. Direct and indirect effects of shared and transformational leadership on employees' perception of knowledge sharing behaviour among peers

Knowledge sharing can be conceptualised as a flow activity, a kind of exchange where one party gives some explicit or tacit knowledge to another party, e.g. a person, a group or a repository (cf. Staples & Webster, 2006). The exchange of knowledge is important for innovation and creativity in contemporary workplaces where employees often have to work in distributed teams, interacting through technological tools and splitting their time between multiple projects simultaneously (cf. Wageman, Gardner, & Mortensen, 2012). A typical characteristic of knowledge workers is their collaboration in relationships for which they and their colleagues have a joint and shared responsibility.

With regard to joint and shared responsibility, shared leadership has been found to be particularly appropriate in managing knowledge workers (Hoch, 2014). With Pearce and Conger (2003, p.1), we define shared leadership as 'a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group organisational goals'. The concept of shared leadership refers to a situation in

which leadership functions are voluntarily shared among employees in pursuit of collective goals, and the concept is characterised by collaborative decision-making and shared responsibility for performance (cf. Carson et al., 2007; Pearce & Conger, 2003). We know from social exchange theory (Blau, 1964) that employees participate in exchange behaviour because they think their benefits will justify their costs. However, because a lack of regulations and guidelines for interaction can hinder knowledge sharing among employees, interpersonal trust is particularly essential for social relations, as these demand cooperation and interdependency (Luo, 2002). Shared leadership encourages employees to become jointly responsible, which might contribute to the creation of a climate of trust that is conducive to cooperation and that promotes employees' willingness to share knowledge. Employees can, thus, rely on mutual inspiration and encouragement to build on each other's ideas by sharing knowledge, and they become willing to share knowledge among peers in return. Therefore, we posit that employees who are engaged in shared leadership perceive more knowledge sharing behaviour among their peers.

Hypothesis 1. *Shared leadership has a direct and positive relationship with employees' perceptions of knowledge sharing behaviour among peers.*

Despite the growing importance of shared leadership, it can be argued that a formal team leader remains important in fostering knowledge sharing behaviour among peers as he/she can contribute to the creation of a climate that is receptive to new ideas and that promotes these ideas among each other (Cabrera, Collins, & Salgado, 2006). Transformational leadership, appointed to a formal team leader, focuses on the relationship between a formal leader and his/her followers and may foster knowledge sharing (Bass & Riggio, 2010; Bryant, 2003). With a transformational leadership style, a formal leader has the capacity to create an atmosphere of trust that contributes to knowledge sharing by using charisma, encouraging intellectual development, and paying individual attention to workers. Leaders who are sensitive to individual needs of group members can respond with an appropriate blend of personal attention, encouragement and challenge. Transformational leaders are capable of facilitating the development of a common sense that they and their employees share. Moreover, transformational leadership enables followers to transcend their own self-interests for a collective higher purpose, mission or vision and to exceed performance expectations (Bass, 1985; Bass & Riggio, 2006). From a social exchange perspective (Blau, 1964), we know that followers, when they receive supportive treatment from their leaders, are more likely to help each other in reaching goals by adopting behaviours that go beyond formal responsibilities. Transformational leadership may contribute to an atmosphere of trust to share knowledge. It is only when employees feel that their willingness to share knowledge is reciprocated by others that the work outcomes needed for a successful organisation can be achieved. We expect that in contemporary workplaces, which are often highly flexible and individualised, transformational leadership has the capacity to create an atmosphere of trust that contributes to knowledge sharing and that may also foster employees' perceptions of knowledge sharing behaviour among peers.

Hypothesis 2. *Transformational leadership has a direct and positive relationship with employees' perceptions of knowledge sharing behaviour among peers.*

In modern work organisations, a formal leader does not usually have the substantive expertise that is needed to handle complex issues requiring innovative solutions. Hence, they are forced to empower their employees and to facilitate and encourage

collaboration between a range of professionals in new team combinations. Because employees oftentimes work in geographically dispersed teams and have to communicate by means of modern technologies, a formally appointed leader has to take a new role in fostering team member leadership activities and encourage employees to higher levels of collaboration and coordination among colleagues (Allen & Ofahengau Vakalahi, 2013; Fausing, Jeonsson, Lewandowski, & Bligh, 2015). Indeed, the literature has shown that transformational leaders have a role in coaching and motivating employees to share leadership responsibilities by inspiring them to jointly achieve a general organisational purpose and specific team objectives (Wang, Oh, Courtright, & Colbert, 2011). Although conceptually different, shared leadership and transformational leadership are indeed interrelated. In fact, it can be argued that shared leadership and transformational leadership on the part of a formal leader are not mutually exclusive. Pearce (2004) already posited that transformational leadership exercised by a formal leader is an important antecedent of shared leadership. An empirical study conducted by Hoch (2014) demonstrated that transformational leadership influences the development of shared leadership, which, in turn, enhances employees' innovative behaviour. As shared leadership has a positive relationship with employees' knowledge sharing among peers, we posit that transformational leadership fosters shared leadership and, in turn, has a positive effect on knowledge sharing among peers.

Hypothesis 3. *Transformational leadership fosters shared leadership, which, in turn, enhances employees' perceptions of knowledge sharing behaviour among peers.*

2.2. The mediating role of basic PNS in the relationship between shared and transformational leadership and employees' perceptions of knowledge sharing behaviour among peers

SDT (Deci & Ryan, 2000) provides us with a theoretical lens to shed light on a possible underlying mechanism that can explain why shared and transformational leadership may foster employees to engage in knowledge sharing behaviour among their peers. The theory focuses on three basic psychological needs. The need for autonomy refers to individuals' need to act with a sense of ownership of their own behaviour and to feel psychologically free. Key is not whether an individual can choose or act independently from the desires of others but to the extent to which this individual endorses that action as his own (Deci & Ryan, 2000). The need for competence is inherent to an individuals' natural desire to feel capable and effective to influence the environment as well as to search for challenges. In work settings, employees feel competent when they develop new skills, achieve goals, and adapt to changing environments (Van den Broeck, Vansteenkiste, De Witte, & Lens, 2008). The basic psychological need for relatedness represents the need to feel connected to others (Deci & Ryan, 2000). This need is satisfied when an individual sees himself or herself as a member of a group, experiences some feeling of community, and can develop close relations (Van den Broeck et al., 2008). These three basic psychological needs are innate, human necessities that must be satisfied to ensure optimal human functioning and well-being. SDT posits that self-determined autonomous motivation is the key mechanism by which the satisfaction of the three basic psychological needs influences employees' outcomes (Deci & Ryan, 2000).

Shared leadership seems to be appropriate in creating a context that facilitates employees' basic PNS, which is likely to result in more self-determination on the part of the employee. According to Carson et al. (2007), shared leadership originates from individuals

taking responsibility for activities that influence peers through interaction. Therefore, shared leadership can be expected to result in stronger feelings of autonomy because individuals will experience a greater sense of autonomy and control over their work (Houghton, Neck, & Manz, 2003a). Furthermore, shared leadership promotes employees to engage in self-leadership and responsible followership (Neck, Houghton, Sardeshmukh, Goldsby, & Godwin, 2013). As the need for autonomy involves viewing oneself as acting with a sense of freedom of choice, sharing leadership among fellow members might encourage situations in which employees' individual need for autonomy is satisfied. In addition, sharing leadership responsibilities could enhance employees' feelings of competence because this offers them flexibility, optimal use of capacities and expertise and opportunities for challenging tasks (Houghton, Pearce, Manz, Courtright, & Stewart, 2015). Therefore, when employees feel competent and skilled because they can learn from and help their peers, the basic psychological need satisfaction for competence will also be met. Finally, shared leadership can provide employees with an increasing sense of meaning, social support and belongingness (Houghton et al., 2015). A sense of belongingness can energise employees and activate inclusion, and hence stimulate them to achieve shared work goals (Ellemers, De Gilder, & Haslam, 2004). For employees who feel that they are closely affiliated with their peers and able to share their joys and problems, shared leadership might facilitate psychological need satisfaction with respect to relatedness. Moreover, shared leadership may prevent employees from feeling disconnected or isolated and distant from their peers, and therefore empower them to build and develop social ties with colleagues in the workplace. In this regard, we hypothesise that shared leadership meets employees' needs for autonomy, competence and relatedness, thus leading to greater self-determination.

Hypothesis 4. *Shared leadership has a direct and positive relationship with the satisfaction of employees' basic psychological needs for autonomy (4a), competence (4b) and relatedness (4c).*

In the literature, the basic PNS of followers resulting from formal leaders' transformational leadership has been postulated as the central explanatory mechanism enhancing followers' effectiveness and motivation (Bass, 1985; Bass & Riggio, 2010). In addition, a transformational leader causes individual followers to view their work as more meaningful and significant, which thus increases the intrinsic motivation potential (Zhu, Avolio, & Walumba, 2009). Transformational leadership is usually conceptualised as a set of four categories of interrelated behaviours on the part of formal leaders, namely 'idealised influencing through vision', 'inspirational motivation', 'intellectual stimulation' and 'individual consideration' (Bass, 1985). Because transformational leadership implies facilitating employees to handle additional responsibilities and giving them professional autonomy by encouraging them to solve problems, this kind of leadership is likely to be productive in fostering satisfaction with respect to the need for autonomy. Transformational leaders who appeal to employees' feelings and emotions, who transmit an enthusiastic vision of the future and who express confidence about successfully reaching individual and team goals might enhance the satisfaction of the need for competence. In addition, by supporting employees in performing and mastering tasks, by spending time with them and coaching them, and by developing and encouraging their strengths, transformational leaders can enhance employees' self-awareness and realise their full potential, which satisfies their need for competence. Furthermore, transformational leaders support satisfaction of the need for relatedness through providing and encouraging team spirit by setting a vision for the group and providing it with a

clear sense of purpose. In this regard, we hypothesise that transformational leadership influences PNS regarding autonomy, competence and relatedness.

Hypothesis 5. *Transformational leadership has a direct and positive relationship with the satisfaction of employees' basic psychological needs for autonomy (5a), competence (5b) and relatedness (5c).*

Only when employees are willing to share knowledge with their peers can organisations manage their knowledge resources effectively (Lee & Choi, 2003). Therefore, it is necessary to know more about the key determinants of employees' knowledge sharing behaviours. Gagné (2009) hypothesised that employees' self-determination through PNS is positively related to intrinsic motivation, which, in turn, stimulates knowledge sharing. We know from previous studies that there is a relationship between a high degree of job autonomy and knowledge sharing. Park, Ribiere, and Schulte (2004) found that encouraging teamwork, employee support and autonomy fosters knowledge sharing, whereas a culture that is demanding of employees discourages knowledge sharing behaviour. Others have argued that autonomy is complementary to knowledge sharing (Llopis & Foss, 2016). In this regard, we posit that when employees experience that their need for autonomy is satisfied, they are also more likely to assume that their fellow peers will engage in knowledge sharing behaviour. Using the capacities and expertise of individual employees so that this responds to employees' cognition of competence may be similar to the concept of self-efficacy as proposed by Bandura (1986). Bock and Kim (2002) argued that self-efficacy could be treated as a major factor or a self-motivational source for knowledge. Moreover, an empirical study conducted by Hsu, Ju, Yen, and Chang (2007) demonstrated that self-efficacy has both direct and indirect effects on individual knowledge sharing behaviour, implying that self-efficacy plays a critical role in guiding this type of behaviour. More recently, studies conducted by Hau and Kang (2016), Yilmaz (2016), and Kang, Lee, and Kim (2017) found that self-efficacy is positively related to knowledge sharing behaviour in an e-learning context. In a study reported by Yoon and Rolland (2012), perceived competence influenced knowledge sharing behaviour in virtual communities. Hence, when employees believe that they are able to effectively perform a particular task by using and developing their skills and competences, they feel motivated and they might, therefore, perceive that this turns out positively for fellow workers' knowledge sharing behaviour. When employees identify themselves as members of a group or of a collective, they may be more energised than when they identify themselves as separate individuals (Ellemers et al., 2004). According to SDT, individuals are likely to strive to achieve group goals when they feel connected (Deci & Ryan, 2000). Indeed, in several knowledge sharing studies, connectivity and relatedness are positively related to knowledge sharing behaviour (cf. Chiu, Hsu, & Wang, 2006; Yoon & Rolland, 2012). We argue that feeling connected with peers or team members can foster employees' motivation to share knowledge with others in the work context as they believe that efforts in fulfilling their own ambitions will benefit the team as a whole. In turn, employees might be more willing to share knowledge. In conclusion, we expect that when employees' needs for autonomy, competence and relatedness are satisfied, thus leading to greater self-determination, employees perceive more knowledge sharing behaviour among their peers. Therefore, we hypothesise the following:

Hypothesis 6. *Satisfaction of employees' basic psychological need for autonomy (6a), competence (6b) and relatedness (6c) has a direct and positive relationship with employees' perceptions of sharing behaviour among peers.*

Finally, we argue from a social exchange perspective that the relationship between individual employees and the organisation can activate employees' knowledge sharing behaviours towards their peers by focusing on the extent to which an employee is self-determined. For example, perceived shared leadership support among peers and transformational leadership from the formal (team) leader may encourage self-determination on the part of employees, which increases their perceptions of knowledge sharing with each other. A study conducted by [Cabrera et al. \(2006\)](#) indicated that employees who perceived their co-workers and supervisors to value knowledge sharing were more inclined to engage in knowledge sharing behaviour themselves. In conclusion, if employees feel self-determined through the encouragement of their peers (shared leadership) and the formal leader (transformational leadership), the individual employee will perceive that other fellow peers will mutually share knowledge, which will, in turn, strengthen the employee's knowledge sharing behaviour. The latter is important as knowledge workers in R&D-units generally participate simultaneously in different and often dispersed teams. In our research, we expect to find that both shared and transformational leadership can influence PNS, which, in turn, enhances employees' perceptions of knowledge sharing among peers. We, therefore, formulate the following two mediation hypotheses:

Hypothesis 7. *The positive relationship between shared leadership and employees' perception of knowledge sharing behaviour is mediated by the satisfaction of employees' basic psychological needs (for autonomy, competence and relatedness).*

Hypothesis 8. *The positive relationship between transformational leadership and employees' perceptions of knowledge sharing behaviour is mediated by the satisfaction of employees' basic psychological needs (for autonomy, competence and relatedness).*

[Fig. 1](#) depicts the hypothesised relationships in the research model.

3. Method

3.1. Data

Data were collected by means of a self-report questionnaire distributed to the entire population of 512 employees working in two R&D units of a knowledge-intensive firm operating in the Netherlands within the sector of foods for special medical purposes. The knowledge workers in our study work in a team and project-based context with the opportunity and flexibility to work independently as regards to time and place. They often work in a virtual or distant setting, interacting with their colleagues using technological tools. Employees divide their time between multiple projects and are concurrently members of multiple teams which operate on a temporary or a permanent basis but which have a formally

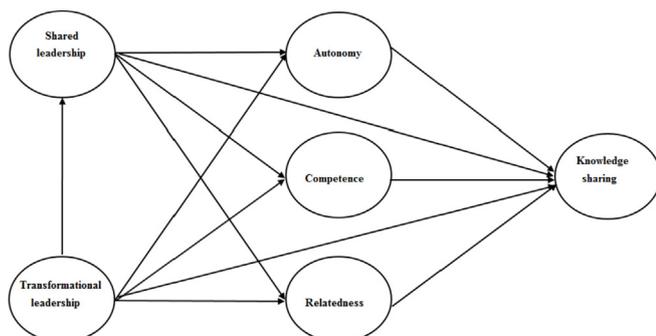


Fig. 1. Hypothesised conceptual model.

appointed supervisor. Their mutual collaboration suggests that they hold joint responsibility. Most workers are employed as project manager, technologist, researcher or statistician. The response rate was 32% (163 respondents). Demographic information is summarised in [Table 1](#). Overall, a small majority of the sample were female (60.1%). Most respondents were aged between 35 and 44 years (36.8%), and most respondents held a master's degree (47.9).

3.2. Instruments

All constructs in the research model are based on reflective multi-item scales. The instruments used for this study consisted of measures for the research constructs as described below. We measured and analysed the constructs on the individual level of employees.

To measure individual employees' perceptions of knowledge sharing among peers, we used the knowledge sharing questionnaire developed by [Staples and Webster \(2008\)](#). The current study focuses on the individual knowledge workers' perceptions of the extent of knowledge sharing by fellow peers (cf. [Srivastava et al., 2006](#)). How do individual knowledge workers perceive that peers share their knowledge with others? Respondents were asked to rate their responses to five items on a seven-point Likert scale. One example of an item is the following: 'People in my team are willing to share knowledge/ideas with each other'.

To measure PNS regarding autonomy, competence and relatedness, respectively, we adapted the five-point Likert scale used in the PNS questionnaire developed and validated by [Van den Broeck, Vansteenkiste, Witte, Soenens, and Lens \(2010\)](#). Each construct consisted of six items. Items were formulated as statements such as 'I really master my tasks at my job'.

To measure individual employees' perceptions of transformational leadership in their unit, we adapted the five-point Likert scale developed and validated by [Hoch \(2013\)](#). There were six items, formulated with statements such as 'My leader is driven by higher purposes or ideals'.

Individual employees' perceptions of shared leadership were measured using an adapted seven-point Likert scale developed by [Hiller, Day, and Vance \(2006\)](#) and further validated by [Shane Wood and Fields \(2007\)](#). An example of the ten items is the following: 'Each member has a say in deciding how resources are allocated in regard to the team's priorities'.

3.3. Procedure

We used variance-based structural equation modelling (SEM) ([Henseler, 2017](#)), which (unlike covariance-based SEM) allows the

Table 1
Sample overview.

	Frequency	Percentage	Cumulative percentage
Gender			
Male	65	39.9	39.9
Female	98	60.1	100
Age			
18–24	13	8	8
25–34	54	33.1	41.1
35–44	60	36.8	77.9
45–54	28	17.2	95.1
55–64	7	4.3	99.4
65 or over	1	0.6	100
Education			
PhD degree	37	22.7	22.7
Master's degree	78	47.9	70.6
Bachelor's degree	39	23.9	94.5
High school	9	5.5	100

predictive power of complex structural equation models to be estimated (Hair, Sarstedt, Ringle, & Guderman, 2017; Henseler, Hubona, & Ray, 2016). Because the nature of our research was explanatory, we also opted for variance-based equation modelling, which makes use of ordinary least squares (OLS) regressions (Hair, Sarstedt, Ringle, & Mena, 2012). Moreover, in variance-based SEM, partial least squares SEM (PLS-SEM) path modelling is the most fully developed system (Hair, Ringle, and Sarstedt (2011), and it has been the subject of various reviews, discussions and serious examinations (cf. Henseler et al., 2016). This has led to substantial contributions to and an increased robustness of PLS-SEM algorithms, including bootstrap-based tests of the overall model fit and consistent PLS-SEM to estimate factor models (Henseler, 2017). As such, PLS-SEM has become an important tool in a diverse range of disciplines, including information system research, strategic management and marketing (for an extended overview, see Henseler, 2017).

We conducted PLS-SEM using SmartPLS version 3.2.3. (Ringle, Wende, & Will, 2015). For the PLS algorithm, we used the path weighting scheme. We set the maximum number of iterations at 300 and used 10^{-5} as our stop criterion. We used a uniform value of 1 as the initial value for each of the outer weights (Henseler, 2010). In view of the rule of thumb provided by Barclay, Higgins, and Thompson (1995), suggesting the use of 10 times the maximum number of paths aiming at any construct in the outer and inner models, the sample size was considered acceptable. The items were based on a five-point Likert scale (except for the shared leadership items, which were based on a seven-point Likert scale) and could be interpreted as continuous variables, thus following the fundamental OLS principles.

4. Results

4.1. Model characteristics

For the outer model evaluation, we examined reliability and convergent validity. We checked reliability using the Nunnally's (1978) Cronbach alpha threshold of 0.7. For convergent validity, we used Fornell and Larcker's (1981) criterion of an average variance extracted (AVE) for each construct above the 0.5 benchmark. All scales appeared to be reliable without removing an item, as illustrated in Table 2. After one item of 'PNS regarding Relatedness' and two items of 'PNS regarding Competence' had been removed, the model demonstrated sufficient convergent validity, the AVE for all constructs being above 0.50 (see Table 2). With the removal of the three items, reliability was maintained.

We subsequently examined indicator reliability. All factor loadings were above 0.60 and, therefore, acceptable (Hair, Hult, Ringle, & Sarstedt, 2014). Finally, we checked for discriminant validity, comparing the AVEs of the constructs with the inter-construct correlations determining whether each latent variable shared greater variance with its own measurement variables or with other constructs (Chin, 1998; Fornell & Larcker, 1981). We

compared the square root of the AVE for each construct with the correlations with all other constructs in the model (Table 3). A correlation between constructs exceeding the square roots of their AVEs indicates that they may not be sufficiently discriminable. For each construct, we found that the absolute correlations did not exceed the square roots of the AVEs. Hence, we concluded that all constructs showed sufficient reliability and validity.

4.2. Common-method variance

As this research was conducted using a self-administered survey method, we tested for common method variance (CMV) to evidence the absence of any systematic bias that might have influenced the collected data (Podsakoff, Mac Kenzie, Lee, & Podsakoff, 2003). We used a two-step approach. First, following Podsakoff and Organ (1986), we used Harman's (1976) one-factor test. Following this approach, we entered all principal constructs into one principal component factor analysis. Using SPSS software (SPSS version 22 for Windows), we applied the extraction method of principal component of one fixed factor with non-rotation method. Results showed the emergence of only one factor, and it explained less than 50% of the variance (27.32%), which gives a first indication of no CMV. Second, we used Bagozzi's method (Bagozzi, Yi, & Phillips, 1991), which stresses that CMV occurs when the highest correlation between constructs is more than 0.90. As shown in Table 3, the highest correlation between constructs is 0.68 (correlation between Knowledge Sharing and Shared Leadership). Therefore, it appears that there is no CMV in the collected data.

4.3. Model estimates

Regarding the inner model evaluation and estimates, we analysed the path coefficients by using bootstrap t-statistics for their significance (Anderson & Gerbing, 1988). For this bootstrapping, we used 5000 subsamples, with a bias-corrected bootstrap, testing for a two-tailed significance of 95%. The model showed sufficient model fit: The standardised root mean square residual was 0.06, which is in line with Hu and Bentler's (1998) criterion of a value lower than 0.08.

As summarised in Table 4, 'Shared Leadership' was found to have a direct relationship with 'Knowledge Sharing' ($\gamma = 0.60$, $p = 0.00$, $R^2 = 0.49$). Together with a high effect size (f^2) of 0.51, there is strong support for Hypothesis 1.

'Transformational Leadership' was not found to have a relationship with 'Knowledge Sharing' ($\gamma = -0.01$, $p = 0.86$). Hence, there is no support for Hypothesis 2.

However, 'Transformational Leadership' was found to have a direct relationship with 'Shared Leadership' ($\gamma = 0.46$, $p = 0.00$, $R^2 = 0.20$) and a medium effect size (f^2) of 0.25. This means that there is also support for Hypothesis 3.

'Shared Leadership' was found to have a weak relationship with 'PNS regarding Autonomy' ($\gamma = 0.25$, $p = 0.00$, $R^2 = 0.20$, $f^2 = 0.07$), a weak relationship with 'PNS regarding Relatedness' ($\gamma = 0.20$,

Table 2
Overview descriptive statistics, reliability and convergent validity scores.

Construct	Actual range	Mean	Standard deviation	Cronbach's alpha	AVE ^a
Knowledge Sharing	3.60–7.00	5.13	0.56	0.80	0.65
PNS ^a Autonomy	1.33–5.00	3.61	0.64	0.88	0.54
PNS Competence	2.17–5.00	4.01	0.56	0.85	0.60
PNS Relatedness	1.80–5.00	3.88	0.69	0.89	0.62
Shared Leadership	1.50–6.80	4.76	0.91	0.91	0.51
Transformational Leadership	1.67–5.00	3.63	0.65	0.89	0.57

^a AVE = Average Variance Extracted.

Table 3
Correlations coefficients and square roots of average variance extracted.

Construct	KS	PNSA	PNSC	PNSR	SL	TL
Knowledge Sharing (KS)	0.80					
PNS Autonomy (PNSA)	0.41**	0.73				
PNS Competence (PNSC)	0.08	0.37**	0.77			
PNS Relatedness (PNSR)	0.34**	0.46**	0.35**	0.79		
Shared Leadership (SL)	0.68**	0.38**	0.08	0.33**	0.72	
Transformational Leadership (TL)	0.35**	0.38**	0.07	0.40**	0.45**	0.75

Note: ** $p < 0.01$ Diagonal numbers shown in boldface denote the square roots of the average variance extracted (AVE) of each construct.

Table 4
Structural relationships with R^2 , predicting power (f^2) and path coefficients (γ).

Constructs ^a	R^2	f^2 values	Coefficient (γ)	T statistics	p values	Hypothesis tested
PNSA -> KS		0.04	0.17	2.44	0.01	6
PNSC -> KS			-0.06	0.85	0.39	6
PNSR -> KS			-0.09	1.21	0.23	6
SL -> KS	0.49	0.51	0.60	8.62	0.00	1
SL -> PNSA	0.20	0.07	0.25	3.41	0.00	4
SL -> PNSC			0.07	0.51	0.61	4
SL -> PNSR	0.19	0.04	0.20	2.24	0.03	4
TL -> KS			-0.01	0.18	0.86	2
TL -> PNSA	0.20	0.07	0.27	3.25	0.00	5
TL -> PNSC			0.02	0.31	0.76	5
TL -> PNSR	0.19	0.10	0.33	3.82	0.00	5
TL -> SL	0.20	0.25	0.46	5.68	0.00	3

^a PNSA = Psychological Need Satisfaction regarding Autonomy; PNSC = Psychological Need Satisfaction regarding Competence; PNSR = Psychological Need Satisfaction regarding Relatedness; KS = Knowledge Sharing; SL = Shared Leadership; TL = Transformational Leadership.

$p = 0.03$, $R^2 = 0.19$, $f^2 = 0.04$) and no relationship with 'PNS regarding Competence' ($\gamma = 0.07$, $p = 0.61$), and as such provides low support for [Hypothesis 4](#).

'Transformational Leadership' was found to have a relationship with 'PNS regarding Autonomy' ($\gamma = 0.27$, $p = 0.00$, $R^2 = 0.20$) but a weak effect size (f^2) of 0.07. The construct 'Transformational Leadership' was found to have an average relationship with 'PNS regarding Relatedness' ($\gamma = 0.33$, $p = 0.00$, $R^2 = 0.19$, $f^2 = 0.10$); 'Transformational Leadership' was not found to have a relationship with 'PNS regarding Competence' ($\gamma = 0.02$, $p = 0.76$), and as such provides partial support for [Hypothesis 5](#).

'PNS regarding Autonomy' was found to have a relationship with 'Knowledge Sharing' ($\gamma = 0.17$, $p = 0.01$, $R^2 = 0.49$) but a partial effect size (f^2) of 0.04. 'PNS regarding Competence' was not found to have a relationship with 'Knowledge Sharing' ($\gamma = -0.06$, $p = 0.39$). In addition, 'PNS regarding Relatedness' was not found to have a relationship with 'Knowledge Sharing' ($\gamma = -0.09$, $p = 0.23$). This supports the conclusion that 'PNS' as such has a weak effect on 'Knowledge Sharing' and provides partial support for [Hypothesis 6](#).

Significant indirect effects were found ($\gamma = 0.06$, $p = 0.03$, $R^2 = 0.49$) to support mediation of PNS in the relationship between 'Shared Leadership' and 'Knowledge Sharing'. This suggests mediation through 'PNS regarding Autonomy', which was found to have a significant direct effect only on 'Knowledge Sharing' ($\gamma = 0.17$, $p = 0.01$) and as such provides low support for [Hypothesis 7](#).

Together with demonstrating indirect effects of 'Transformational Leadership' on 'PNS regarding Autonomy' ($\gamma = 0.13$, $p = 0.01$) through 'Shared Leadership', and in view of only a significant direct effect of 'PNS regarding Autonomy' of all three PNS variables on 'Knowledge Sharing' ($\gamma = 0.17$, $p = 0.01$), the results suggest weak but significant indirect effects, which supports full mediation through 'PNS regarding Autonomy' and as such provides partial support for [Hypothesis 8](#).

5. Discussion

5.1. Theoretical implications

The aim of the present study was to contribute to the literature by using social-exchange and SDT to examine how both transformational leadership and shared leadership may directly contribute to employees' perceptions to engage in knowledge sharing behaviour among peers, or may do so indirectly through employees' basic PNS. The main outcomes of this research are summarised and discussed below.

5.1.1. The direct and indirect effects of leadership on employees' perceptions of knowledge sharing behaviour among peers

First, we found a strong positive direct effect of shared leadership on the perceptions of employees' knowledge sharing behaviour among peers. More concretely, under the condition of shared leadership, employees seem to be willing to share their ideas with their peers more frequently. This condition of shared responsibilities enhances employees' trust and ensures that they take responsibility for their work that requires knowledge sharing. Employees hold each other accountable and expect a reciprocity in knowledge sharing in order to successfully perform their increasingly complex and sophisticated tasks. Those results expand previous results shown by [Lee, Lee, and Seo \(2015\)](#) and [Han, Lee, Beyerleind, and Kolb \(2018\)](#).

Second, in contrast to prior studies which have suggested that transformational leadership has a direct and positive effect on knowledge sharing, we did not find a direct effect of transformational leadership on the perception of knowledge sharing behaviour. However, we did find an indirect effect of transformational leadership on knowledge sharing through shared leadership. Shared leadership encouraged by transformational

leadership is important in stimulating knowledge sharing, although the influence of shared leadership exceeded that of transformational leadership when it comes to fostering knowledge sharing. Nevertheless, our study confirms our assumption that a formal leader's transformational leadership style is needed as it can enhance shared leadership and, ultimately, fuel employees' perceptions of knowledge sharing behaviour among peers. In addition, our study confirms the interrelatedness of transformational and shared leadership; this is in line with prior research by Hoch (2013), who found that transformational leadership was an important predictor of shared leadership. Nevertheless, our study was the first to show the indirect effect of transformational leadership via shared leadership on employees' perceptions of knowledge sharing behaviour among peers. Despite the growing importance of self-management and shared leadership, transformational leadership plays a role by stimulating shared leadership and by generating trust and confidence in employees' reciprocity, resulting in the willingness to share their knowledge with others.

5.1.2. The mediating role of basic PNS in the relationship between leadership and employees' perceptions of knowledge sharing behaviour among peers

Our study also focused on the role of employees' self-determination through basic PNS, as an explanatory mechanism underlying the relationship between shared and transformational leadership and knowledge sharing behaviour.

First, we found a mediating effect regarding the need for autonomy for both shared and transformational leadership. This result demonstrates that shared and transformational leadership are positively associated with psychological need satisfaction regarding autonomy, which enhances employees' perceptions of knowledge sharing among peers. The result found for the mediation effect regarding the need for autonomy expands what we know from the SDT literature, as this need for autonomy is seen as the most important element in determining the degree of intrinsic motivation achieved (Deci, Olafsen, & Ryan, 2017; Gagné & Deci, 2005). Furthermore, our mediation analyses revealed that there may be two additional indirect pathways (besides the direct pathway of shared leadership on knowledge sharing, as discussed above) to stimulate employees to engage in employees' perceptions of knowledge sharing behaviour. Especially in a contemporary workplace where knowledge workers often work virtually or remotely, with the freedom to work when and where they want, the need for autonomy might be important for creating some form of control in order to function. A study by Van Yperen, Wortler, and De Jonge (2016) showed that only workers who have a strong need for autonomy may feel that working in a flexible work context (with the discretion to decide when and where to work) fits them well. We might assume that in an R&D context where employees often work virtually or remotely and who split their time between multiple projects simultaneously, it is important that their colleagues and their peers as well as their formal team leader encourage knowledge workers, so that they may experience that their need for autonomy is satisfied. In turn, this feeling of being autonomous and self-determined is important for the perception of the willingness of knowledge sharing behaviour among fellow employees. In this regard, the process involving the fulfilment of the need for autonomy can be seen as an exchange process (Blau, 1964). The perceived shared leadership support among peers combined with transformational leadership from the formal (team) leader encourages self-determination on the part of the employee, which increases employees' perceptions of the usefulness of knowledge sharing with each other. In our opinion, although employees may be psychologically empowered, formal leaders and peers remain important actors to satisfy individuals' need for

autonomy and, in turn, to enhance employees' perceptions of knowledge sharing among peers.

Second, in contrast with our expectations, we did not find a mediation effect for PNS regarding relatedness, although a positive trend could be seen from both shared and transformational leadership towards the satisfaction of this need. It seems that leadership can generate an atmosphere of trust that enhances employees' individual feelings of belongingness. As trust and psychological safety may not always be present in contemporary workplaces, peers and formal leaders definitely have a role to play, namely by sharing leadership responsibilities and engaging in transformational leadership, respectively (Siemsen, Roth, Balasubramanian, & Anand, 2009). However, this is insufficient for believing that fellow peers will share knowledge, particularly in view of the non-significant relationship between relatedness satisfaction and knowledge sharing.

Third, we could not find a mediation effect for PNS with respect to competence: Neither shared leadership nor transformational leadership significantly affected competence satisfaction. Still, transformational leaders are traditionally seen as having the ability to motivate their employees to develop skills and knowledge so that they can respond to various challenges (Bass, 1985; 1990), which, in turn, may enhance competence satisfaction. The lack of significant relationships between leadership and competence satisfaction as revealed in this research might be explained by the fact that especially R&D knowledge workers have their own specialisations and competences (Coradi et al., 2015). Because of the high degree of specialisation demonstrated by the professionals in our sample, employees may not necessarily need to learn new competences from their formal leader or peer colleagues, but rather learn these by attending external training and education programmes. Furthermore, we did not find a relationship between competence satisfaction and knowledge sharing. It is possible that competent employees do not always engage in knowledge sharing, as they fear it may diminish or undermine their own power and career opportunities. Especially knowledge workers in competitive contexts may want to control and enhance their career potential to ensure their own lifelong employment and personal career success (Van der Heijden, Peters, & Kelliher, 2014). In addition, employees who do not identify sufficiently with the organisation and their peers may fail to experience the exchange of knowledge sharing among fellow peers (Koriat & Gelbard, 2014). Finally, the increase in teamwork that characterises contemporary workplaces may call for team-based reward systems to promote knowledge sharing in order to achieve common goals and improve team performance (Peters, Ligthart, Bardoel, & Poutsma, 2016). As in our case organisation the rewarding of employees was based on individual performance, this may inhibit knowledge sharing (Foss, Pedersen, Reinhold Fosgaard, & Stea, 2015; Garbers & Konradt, 2014).

5.2. Limitations and directions for future research

The present study had some limitations. As we used a cross-sectional design, the dynamic interplay between shared and transformational leadership could not be studied, which precluded the determination of causal relationships. Consequently, we were unable to comment on the dynamic interaction between those two leadership approaches and their association with employees' perceptions of knowledge sharing behaviour with peers. We encourage future researchers to conduct a longitudinal study of these relationships by using a sample of employees to be investigated at different development and lifecycle stages. Moreover, additional qualitative data could provide more information and deeper insights into the relationship particularly between shared

leadership and knowledge sharing and the role of employees' self-determination. Most commonly, studies on leadership are conceptual by nature, or they employ surveys.

Despite the significant and positive relationships that were found to exist between leadership and knowledge sharing, our research focused particularly on R&D professionals operating within the context of a single organisation active in the sector of foods for special medical purposes. This approach enabled us to cover an interesting group of professional R&D knowledge workers in one case study. Additional empirical investigations are needed in other business units of this particular organisation as well as within other organisations and knowledge-intensive sectors, so that the results can be generalised.

We investigated the role of shared and transformational leadership in fostering knowledge sharing behaviour among peers, but we cannot exclude the effects on such knowledge sharing that may be exerted by other variables such as culture and incentive systems. Future studies could explore the impact and role of other variables on knowledge sharing.

In this study, we were interested in the individual perceptions of the employed knowledge workers themselves, in terms of how they perceive the sharing of leadership responsibilities and activities as well as how they perceive knowledge sharing among (or on behalf of) their peer colleagues. Given the purpose of this study, aggregation to other levels was not deemed necessary. Still, future research might want to focus on examining identification with the group or organisation at individual as well group levels while exploring the respective relationships with other group level variables.

5.3. Managerial implications

Our findings have a number of implications for organisations, managers, team leaders and employees in contemporary workplaces. These workplaces can be increasingly characterised as flat organisations with team-based structures and self-managing teams in which employees can and are expected to effectively manage themselves.

However, shared leadership, embedded in and encouraged by the transformational leadership of formal (team) leaders, is most important in helping employees create trust that is conducive to sharing responsibilities and activities which promote knowledge sharing. This is especially true for knowledge workers, who often work in distributed teams and split their time between multiple projects simultaneously – situations in which knowledge sharing can be disrupted or fragmented. Building awareness of the importance of shared and transformational leadership in particular necessitates the training and development of leaders and employees alike, and this should be incorporated into HR development programmes.

Fellow knowledge workers as well as formal leaders have a crucial role in strengthening shared leadership capacities and in enhancing employees' self-determination, which, in turn, can create confidence and lead to increased willingness to engage in knowledge sharing behaviour in the workplace. This may be pertinent not only for maintaining a healthy and productive work context for employees but also for attracting and retaining talent (Ehnert, 2014).

Our results also imply that in knowledge-intensive environments both peers and formal leaders can play an important role in giving employees a sense of autonomy and in strengthening both their identification with the organisation and their belongingness. This may have important consequences for managers as well as employees who seek to implement particular types of rationalities within their team-based organisations.

5.4. Conclusion

Our research has added to the leadership and knowledge sharing literature by focusing on the role of shared and transformational leadership in enhancing employees' perceptions of knowledge sharing behaviour among peers in contemporary workplaces. Using a social exchange and self-determination lens, we showed that shared leadership, in particular, can ensure that employees expect to be – and perceive that they are – collectively responsible, something that generates trust in each other's knowledge sharing behaviour. In addition, transformational leadership provided by a formal leader was shown to remain important, as this has the potential to fuel shared leadership, which increases employees' confidence in knowledge sharing behaviour among peers. Finally, we found support for employees' psychological need for autonomy to be satisfied as an explanatory mechanism revealing how both shared and transformational leadership are important conditions for fostering employees' perceptions of knowledge sharing behaviour among peers in contemporary workplaces.

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