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Pro-socially motivated knowledge hiding in innovation teams

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1. Introduction

This study examines why R&D staff may hide requested knowledge from their colleagues. Innovation based organisations depend crucially on the generation and flow of knowledge for new products and processes. Knowledge management, or the effective capture, sharing and implementation of knowledge inside and between organisations, is seen as an essential capability underpinning higher innovation and performance in technology-intensive organisations (Seo et al., 2017; Dziallas and Blind, 2019; Wang and Hu, 2020). Organisations seek to leverage the intellectual capital generated by employees through knowledge management systems, often software based, and also through setting organisational norms, often reinforced by performance evaluation systems. This is especially crucial in R&D where increasing specialisation of knowledge demands increased sharing to enable the integration of knowledge into new products (Huang, 2009). Organisations, however, do not automatically possess the intellectual tacit knowledge of their employees and therefore they cannot force their employees to share this knowledge (Kelloway and Barling, 2000). This means that employees can choose to hide knowledge, a phenomenon recognised in the literature as knowledge hiding (KH). Knowledge hidden in the minds of employee's cannot be used to increase an organisation's performance (Bontis, 1998) and therefore knowledge hiding represents a unique problem for innovation and R&D. Within the research on innovation, an understanding how to facilitate knowledge sharing has become an important topic for academics and practitioners alike (SaideAini et al., 2016). Despite extensive development and implementation of knowledge sharing practices in knowledge-intensive R&D performing organisations, knowledge hiding can and does occur.

There is an emerging stream of literature that calls for attention to be paid to the role of individuals in knowledge creation and transfer, identifying the individual and their motivations as an important microfoundation of organisational level innovation performance (Ankrah et al., 2013; Yildiz et al., 2020; Klofsten et al., 2020; Kör et al., 2020). Despite the importance of knowledge sharing, relatively few studies have examined the motivations for knowledge hiding, especially in an R&D context. Knowledge hiding is when an employee intentionally attempts to hold back or hide knowledge in response to it being requested by somebody else (Connelly et al., 2012). Although there is much research conducted with respect to knowledge sharing motivation, there is little conducted in the region of knowledge hiding (Wang and NOE, 2010; Connelly et al., 2012; Serenko and Bontis, 2016). A number of studies identify the antecedents of knowledge sharing (Witherspoon et al., 2013; Qureshi and Evans, 2015). However, it is unclear if the antecedents of KS have an influence in reducing knowledge hiding behaviours (Serenko and Bontis, 2016). It has been argued that knowledge hiding and sharing are not opposite ends of the spectrum but rather two very distinct behaviours with different antecedents (Hinds et al., 2001; Ford and Staples, 2010; Connelly et al., 2012; Tsay et al., 2014; Connelly and Zweig, 2015). Furthermore, empirical studies to date have assumed that KH is carried out with a negative employee motivation and detrimental impact on the team and the organisation. Without knowing why employees may refuse to share requested knowledge we do not know how to manage this behaviour. If we assume all knowledge hiding behaviours have a negative outcome, then we may concentrate on eliminating knowledge hiding with unintended consequences for

performance.

In this paper we look at why R&D employees hide requested knowledge from their team members and the wider organisation, and we find that there is often a pro-social motivation behind knowledge hiding that shows that employees can be motivated by care for their team and for the organisation. We begin by discussing the theoretical background to knowledge sharing and knowledge hiding, identifying the opportunity to extend this work by focussing on individual motivation and behaviour. We then outline our research design before presenting our findings of qualitative interviews with R&D engineers in a technology-intensive sector in order to better understand their experiences and motivations with respect to knowledge management and knowledge hiding. We discuss the significance of our research for firms in terms of maximising the value of KS and KH for innovation and performance. This paper identifies a new aspect of KH and contributes to theory and practice by extending our understanding of the motivations behind KH to include pro-social intentions. The discussion section focuses upon the implications of new KH findings for the ideation, idea selection phases of the innovation process and highlights how KH may, perhaps counter-intuitively, help firms to innovate.

2. Theoretical background

Technology intensive organisations rely crucially on employee learning and knowledge to deliver innovative products. These organisations typically invest strongly in knowledge management, ensuring that purposeful sharing of knowledge is integrated into the company's strategy, with top management support, in order to encourage an environment that facilitates knowledge transfer through providing a positive work-place culture and norms (Cabrera and Cabrera, 2005; Moffett et al., 2003; Jones et al., 2006). However, barriers to knowledge sharing remain and can serve to frustrate the organisational intention to share knowledge and foster wider learning. Broadly speaking barriers can be at the organisational level, such as poor fit between the existing corporate culture and the adoption of knowledge sharing practices, they can be technological barriers or they can exist at the level of individual employee behaviours and attitudes (Riege, 2005).

Individuals can exhibit a range of knowledge management behaviours (KMBs) and counter productive workplace behaviours (Pearson et al., 2004) that reduce knowledge sharing. Two key KMBs that reduce knowledge sharing are knowledge hoarding where individuals fail to share knowledge that they possess (Holten et al., 2016) and knowledge hiding which is intentional. Knowledge hiding is defined as occurring when a person purposefully conceals knowledge that has been requested (Connelly et al., 2012). KH is more than a failure to share, and involves both a request for knowledge and the decision to refuse or evade the request, despite the knowledge being held. This is knowledge that someone has requested because they need it, so already carries a value, whereas hoarding of knowledge may be knowledge that is or is not of use. Furthermore, KH is not a passive act, it requires an intention and a strategy to frustrate the request, so it directly concerns the motivations of individuals in respect of knowledge transfer. Furthermore, because KH involves a dyad, the requester and the requestee, the evasion or deception involved can have a direct impact on relationships between the actors involved, the teams they work in, as well as the organisational culture (Connelly et al., 2012). We focus on knowledge hiding because within an R&D performing unit, the deliberate hiding of requested knowledge has the potential to limit the successful operation of the unit.

2.1. The implications of knowledge hiding for knowledge transfer

Knowledge hiding has been shown to be a pervasive phenomenon, practised and experienced by a majority of employees, across sectors and national cultures (Connelly et al., 2012; Peng, 2013). The literature has identified three ways in which KH is practised: through evasive hiding, rationalised hiding and playing dumb (Connelly et al., 2012).

Evasive hiding is behaviour where the individual avoids providing correct information, by falsely promising to provide it later or providing inaccurate knowledge. Playing dumb is where the individual falsely denies having the requested knowledge. Rationalised hiding is practised where the individual gives a justification for not providing knowledge. Both evasive hiding and playing dumb involve deception, whereas in rationalised hiding the knowledge hider is transparent about their intention not to share.

The identified negative impacts of KH on organisations and employees are wide ranging. KH has been shown to have negative implications for organisations through reduced team creativity (Černe et al., 2014; Bogilović et al., 2017), impaired knowledge transfer (Huo et al., 2016) and increased job turnover (Serenko and Bontis, 2016). Inter-personal relationships are also affected, with greater distrust (Connelly et al., 2012) and retaliatory KH by co-workers (Connelly and Zweig, 2015). There are also identified impacts on the knowledge hider's performance, with reduced creativity (Rhee and Choi, 2017), sense of thriving (Jiang et al., 2019), job satisfaction and empowerment (Offergelt et al., 2019). The potential impact of KH on a knowledge intensive, team-based function like R&D is significant: the lost value of unshared tacit knowledge; the cost of reproducing hidden knowledge; the harm to team commitment and trust; the reduction in creativity and innovation (Serenko and Bontis, 2016).

Given the counterproductive outcomes of KH identified in the literature, there has been a call for research into the causes or antecedents of KH (Connelly et al., 2012). Work on antecedents has looked at the situational contexts that give rise to KH behaviour. Organisational cultures characterised by high competitiveness and a performance-focussed (rather than a learning-focussed) climate (Hernaus et al., 2019; Černe et al., 2014) are associated with higher levels of KH. The relationship with the supervisor can affect levels of KH, through failing to support organisational commitment, in the performance feedback provided, or sending signals that tacitly encourage KH (Offergelt et al., 2019; Zhu et al., 2019; Zhao et al., 2019). The way work is organised can also have an impact, with task interdependence reducing KH (Fong et al., 2018; Hernaus et al., 2019) and inter-cultural teams more at risk of KH (Bogilović et al., 2017). Time pressure is another factor driving KH. Time pressure has been found to increase levels of KH (Škerlavaj et al., 2018). More recent work differentiates between challenging time pressure from complex work which is motivating and found to be associated with lower KH and hindrance time pressure which is associated with reduced resources, demotivation and found to be associated with increased KH (Zhang et al., 2021).

There is also an emerging stream of research on the personal moderators of KH behaviour. When employees define success as doing better than others rather than learning goals (Rhee and Choi, 2017; Zhu et al., 2019), when they are cynical about their organisation (Jiang et al., 2019), or perceive that they are being ostracised (Zhao et al., 2016) then KH behaviours are more likely to occur. Personal characteristics also affect KH behaviour. Social status is defined as the individual's valuable capabilities and knowledge that are important for the organisation's goals and KH behaviours by high status individuals have greater negative impact (Rhee and Choi, 2017). Where employees feel psychological ownership of valuable knowledge, KH increases as the knowledge owners behave in territorial ways (Peng, 2013; Huo et al., 2016; Singh, 2019).

As described above the growing research in this area has described the characteristics and prevalence of the phenomenon, as well as its outcomes and antecedents. What is common across all extant work is that KH is seen as a counterproductive behaviour with negative causes and impacts. In defining knowledge hiding, Connelly et al. were careful to describe the behaviour as 'not a uniformly negative behaviour' (2012: 65) but one that may have positive, pro-social motivations and outcomes related to protecting the hider, others or the organisation from the harmful consequences of sharing the requested information. Nonetheless, the negative understanding of KH intentions and outcomes

predominates in the literature and KH is researched as a negative or counterproductive behaviour (Connelly et al., 2012; Serenko and Bontis, 2016), motivated by anti-social drives (Connelly and Zweig, 2015) that is a threat to organisational performance (Černe et al., 2014; Huo et al., 2016). The other notable feature of the body of research in this area is that the methods used have almost been exclusively quantitative, involving either surveys or experiments. One exception is the study that has come to define the term KH, which combined a survey with qualitative interviews looking at how people practice KH and established the typology of rationalised hiding, evasive hiding and playing dumb (Connelly et al., 2012). If research designs start from the assumption that KH is negative in its motivations and its impacts, hypotheses are framed in this way, and concepts operationalised and tested using closed question instruments, negative KH can only be confirmed or disproved, but there is no opportunity for positive KH to be identified. While the potential for positive KH is often acknowledged, it has never been the focus of any KH research to date, leading to recent calls for the need to explore pro-socially motivated KH (Connelly et al., 2019).

2.2. Motivations for KH

Individual level factors that affect KH are significant, because of the impact of new and tacit knowledge held by individuals on innovation outputs, but also because of the difficulty of managing individual attitudes and motivations. Understanding the motivations for knowledge management behaviours are necessary to develop insight into how to best manage knowledge through organisational practices to achieve innovation goals. Gagné (2009) propose that to understand motivation in knowledge management behaviours (KMBs), we need to take account of the differences in types of motivation. For example, knowledge sharing has been shown to be strongly influenced by internally generated motivation, but weakly or even negatively associated with attempts to provide motivation extrinsically through rewards and sanctions (Zhao et al., 2016; Gagné, 2009; Ryan and Deci, 2000). Gagné's model, based on self-determination theory, proposes that motivations differ according to their underlying intentions (see Fig. 1). Autonomous motivation is self-determined and can be intrinsically driven by an intention to achieve enjoyment or interest, or extrinsically driven by the desire for meaningful work. Controlled motivation relates to intentions driven by requirements, either required to satisfy your self-esteem or to respond to external rewards or sanctions (Gagné, 2009; Gagné et al., 2019).

Gagné's model was developed originally to explain knowledge sharing (2009), and has been further developed to apply to knowledge hiding (Gagné et al., 2019), showing that although KS and KH are two different types of KMB (Connelly et al., 2012), with different motivating drivers hypothesised, they can be understood as being underpinned by a common theory of workplace motivation. Autonomous motivation (AM) has been shown to be related to KS but the results on the relationship between AM and KH were less conclusive (Gagné et al., 2019) with the hypothesised negative relationship between AM and KH being disproved in part of the study. Although literature to date has hypothesised a negative role for KH, we propose to use Gagné's model to examine positive and negative KMBs, allowing us to surface positive KH as a concept.

Autonomous motivation is considered to be the most important motivational factor for positive KMBs, in common with many other forms of positive organisational behaviour (Gagné et al., 2019). Factors that reduce or increase AM may impact on KMB. Where organisational climate and personal goals are framed around learning and mastering knowledge, this supports AM (Černe et al., 2014; Rhee and Choi, 2017; Zhu et al., 2019) and should support positive KMBs. Where the emphasis is on performance and competitiveness, providing for controlled motivation through rewards/sanctions, positive KMBs are discouraged or weakened (Serenko and Bontis, 2016). Time pressure can also reduce AM and hence positive KMBs (Škerlavaj et al., 2018; Gagné et al., 2019). However, time pressure where the pressure is perceived as motivating reduces KH (Zhang et al., 2021). The level of organisational commitment by the individual is also related to AM and positive KMBs (Serenko and Bontis, 2016; Zhao et al., 2016; Jiang et al., 2019) Pro-social motivation, the desire to benefit or protect others (Grant, 2008), has been looked at in the context of KH. Individuals with high pro-social motivation are better at perspective-taking, allowing them to see the larger organisational goal, reducing the negative impacts of time pressure and reducing negative KMBs (Škerlavaj et al., 2018.). Where leaders foster a team based pro-social motivation this discourages negative KMBs, such as hiding knowledge from team-other members (Babič et al., 2019).

A link between pro-social intentions and rationalised hiding as the KMB has been hypothesised although never explicitly researched (Connelly et al., 2012). Rationalised hiding (RH) is the least deceptive of the three KH strategies used to decline to share knowledge with a requester because the refusal to provide knowledge is explained or rationalised. Research has supported a difference between RH and the other two forms of KH (evasive hiding and playing dumb). People on the receiving end of RH events perceive that they will have a *better* relationship with the knowledge hider in the future and both the hider and the target do not anticipate retaliatory KH (Connelly and Zweig, 2015). RH behaviours are associated with increased job satisfaction, reduced turnover intentions, higher psychological empowerment and organisational identification (Offergelt et al., 2019; Zhao et al., 2019). Performing RH does not induce guilt and shame, although evasive hiding and playing dumb do (Burmeister et al., 2019). Machievellian personality traits are associated with higher levels of evasive hiding and playing dumb but not with higher RH (Pan et al., 2016). High knowledge complexity or having a knowledge-sharing climate does not influence levels of RH although it does increase evasive hiding and playing KMBs (Connelly et al., 2012). RH does not have negative consequences for interpersonal trust or employee attitudes, for either those carrying out RH or those experiencing RH, nor does it have the same antecedents as evasive hiding and playing dumb, being unrelated to negative personality traits and challenging organisational contexts. These differences emerged even when hypotheses were framed around RH as a negative KMB and suggest that pro-social KH warrants further investigation.

The theoretical framing that we take into our empirical research focuses on the motivations held by individuals towards KMBs, both knowledge sharing and knowledge hiding. We distinguish between autonomous and controlled motivation in looking at the intentions underlying KMBs. Rather than treating KH as always negative, we

	Autonomous Motivation	Controlled Motivation
Intrinsic Motivation	motivated by interest or enjoyment	motivated by need for self-esteem or ego gratification
Extrinsic Motivation	motivated by values and personal meaning	motivated by rewards or sanctions

Fig. 1. Typology of motivation (derived from Gagné (2009) and Gagné et al. (2019)).

distinguish between positive and negative KMBs, where positive KMBs support organisational performance, even if they involve KH behaviours. We also take into account that KMBs happen within an organisational context that has an influence on individual motivation by supporting or frustrating the achievement of psychological needs for individuals to feel competent, autonomous but also connected (Gagné et al., 2019). Context can include the prevailing organisational norms or climate: whether the organisation values learning and mastery or has a focus on ranked performance and competitiveness between employees; the level of time pressure put on employees; the extent to which leadership fosters organisational commitment and respect. The nature of the work can have an influence: the complexity and tacitness of the knowledge involved, the level of autonomy or opportunity for discretionary action, and the team or interdependent structure of work. Motivation is also affected by characteristics that are personal to individual employees: seniority can influence attitudes to KH, as can status as someone with valuable knowledge, and personal sense of ownership and protectiveness of knowledge.

3. Research design

Our goal is to understand the motivations for knowledge hiding behaviour by those practicing or experiencing it in a context where such knowledge is of significant importance to innovation and therefore firm success. We ask why individuals might choose to hide requested knowledge from their team members and the wider organisation given its emphasis and importance to innovation We examine the motivation for KH without the assumption of negative motivations or consequences for organisational performance.

3.1. Context

Knowledge sharing is an essential element in any knowledge-based firm, but particularly so for R&D settings. Our study is of innovation engineers in a single knowledge intensive organization. The organisation has a high requirement for technical knowledge from its engineering experts and a diverse work force in terms of age and tenure, and consequently has made significant investments in knowledge management with a defined strategy, technical systems to codify and effective practices for socialised knowledge in place, designed to enhance KS and eliminate KH. The selected site is a manufacturing plant of a multinational medical device company where knowledge sharing and knowledge management are key components of the organisational strategy and culture. Selecting an organization where knowledge sharing is necessary and encouraged provided a good opportunity to learn (Stake, 2008) about knowledge hiding. The plant, a subsidiary of a global medical device company, develops and manufactures implantable defibrillators and pacemakers. The main functional groups in the plant are: production, manufacturing, supply chain, quality, lean, regulatory, finance, process development, product performance, process development and R&D. There are many contextual influences on KS behaviour stemming from the organisational context, such as managerial styles, compensation systems, training, job design and sharing norms (Gagné, 2009); our design is intended to control for these by using a single site, allowing us to examine motivations around knowledge transfer in a single organisational context (Yin, 2013).

3.2. Sample and data collection

KH is by its nature challenging to research as the behaviour cannot be observed directly (Connelly et al., 2012). We want to understand motivation for KH, and this too cannot be observed but requires asking participants. Because of these two characteristics, data triangulation through other data sources was not open to us. We collected qualitative data in preference to quantitative, as the concept of KH is emerging rather than mature (Xiong et al., 2019); quantitative data collection

would have required us to prescribe the features of KH. We interviewed 12 innovation engineering staff to collect qualitative data about their experiences with knowledge sharing and knowledge hiding. Informants were purposefully selected to provide a range of seniority levels across two key engineering groups, Manufacturing and R&D. These groups frequently collaborate to develop innovation projects with global impact using Design For Manufacturing (DFM) processes.

Table 1 presents a typology of informants for this study. Engineer 1 level staff are starting out in their career and have one to four years experience. Engineer 2 level staff have five to twelve years of experience. Senior Engineers have ten years or more experience and significant levels of process and product knowledge. Principal Engineers have in-depth and detailed knowledge of products, processes and the business operations and they drive new technologies and new product introduction; they also manage more junior engineering staff. Fellow Engineers develop next generation products and processes, their work is focused on three to four generations ahead of current offerings.

KH is a potentially sensitive topic. It occurs when a request for knowledge is intentionally refused, either directly or through evasion. At the level of the original request this has the potential to damage trust in a relationship. And in an organization and occupation that explicitly values KS, to practice KH risks censure. This has implications for our research – both in the self-reports of the existence of knowledge hiding and in the motivations ascribed to the behaviour. We took this into account by framing questions around knowledge hiding in a neutral manner, for example 'will you always try to share knowledge?' Data was collected by one of us who works as an engineer in the organisation. This role as a member of the organisation was an advantage, in that inter-personal trust and shared understanding encourages open sharing of experiences and motivations (Dwyer and Buckle, 2009). It could also have a negative impact on openness if informants were concerned to manage their reputation with a colleague; we balanced this insider perspective with the outsider view of the other members of the research team, providing objectivity (Dwyer and Buckle, 2009; Huikkola et al., 2021).

Interviews were conducted in a one-on-one and face-to-face setting and audio was recorded. The interviews ranged from 30 min to 60 min long and the data were transcribed to prepare for analysis. We used a semi-structured interview guide to ask participants about the organisational norms and systems related to knowledge sharing; their own experiences of practicing and experience knowledge hiding; their attitudes and motivations for knowledge sharing and hiding. The semi-structured design was selected as it provides consistency between interviews, while allowing a natural flow conducive to open discussion and the emergence of unanticipated topics. Interviews were conducted in a one-on-one and face-to-face setting and audio was recorded. The interviews ranged from 30 min to 60 min long and the data were transcribed to prepare for analysis.

Table 1
Summary of informants.

Identifier	Position	Age	Tenure (years)	Innovation Role
INT 1	Engineer 1	25–30	<5	R&D
INT 2	Engineer 1	25–30	<5	Manufacturing
INT 3	Engineer 2	30–35	5–9	R&D
INT 4	Engineer 2	30–35	5–9	Manufacturing
INT 5	Senior Engineer	35–40	10–19	Manufacturing
INT 6	Senior Engineer	35–40	10–19	Manufacturing
INT 7	Senior Engineer	30–35	10–19	R&D
INT 8	Senior Engineer	45–50	>20	Manufacturing
INT 9	Principal Engineer	35–40	10–19	R&D
INT 10	Principal Engineer	40–45	>20	Manufacturing
INT 11	Fellow Engineer	50–55	>20	R&D
INT 12	Fellow Engineer	55–60	>20	R&D

3.3. Data analysis

The data were uploaded to an electronic analysis application for qualitative research (Nvivo12). The data was analysed and coded using a concept-driven approach to enable a greater synthesis of findings across informants. During first order coding we coded for broad categories of KM behaviour, expressed motivations and contextual factors. Second order coding refined these categories, focussing on motivations and dispositions During the coding process, emergent coding as used to accommodate data that did not fit with the identified concepts. These codes stood outside of the previous literature and formed the basis of new, pro-social motivations for KH behaviours. Cross-tabulated tables were used to examine the relationships between concepts. Fig. 2 presents the themes developed in the coding process. This led to the final conceptualisation presented in the next section.

4. Findings

We look at the practice of knowledge hiding practices and drivers. We examine the prevailing organisational context with respect to knowledge work and norms. We then look at drivers of knowledge management, relating to the organisational context and individual motivations. We identify new forms of practices and underlying motivations in knowledge hiding.

4.1. Practice of knowledge hiding in R&D teams

Respondents identified experiences of knowledge hiding (KH), with the majority of the engineers interviewed having received, practised or observed KH (see Table 2). Knowledge hiding was more likely to have been experienced, both received and practised, by senior engineers, with the three most junior engineers saying they had no experience of KH. 'When you have been in the industry as long as I have you will have seen it all … You are also more likely to have seen people who do not share

openly with you' (INT 12).

Rationalised hiding is providing a true reason why the knowledge cannot be shared. The twelve engineers we interviewed did not provide evidence of having practiced, experience or observed rationalised hiding. As described in the literature, RH is perceived more positively and has fewer negative consequences to the other more deceptive forms of KH. This may be why our respondents did not characterise RH that they have practiced, experienced or observed as KH.

Playing dumb is where the request is frustrated by the request recipient denying that they have the requested knowledge. 'You do become recognised as the SME [subject matter expert] … which can be annoying if you are trying to get your own job done. If you have ten people lining up to ask you the same question, you will just say you do not know' (INT4).

Evasive hiding is making an excuse to avoid providing the knowledge. Generally this is in the form of giving a reason to delay providing the knowledge that has been requested and then deliberately not following up. Engineers reported receiving this as a common reason for not sharing knowledge and also reported using this as a strategy to appear helpful while also evading the request, 'I also tell them I will get back to them. I do not really plan on it. I am just too busy and time is taken away from my job … It makes me look like I am trying to help" (INT4).

Partial hiding is another strategy identified by respondents that is used to frustrate a request for knowledge. This strategy has not been identified in previous KH literature. The engineers interviewed gave examples of partial hiding strategies they had both experienced and used to deflect requests for knowledge by intentionally limiting the response given. The intention on the part of the hider is to comply with the request by proving some information while knowingly hiding the full information. 'I will give them some bit … and so they think I am helping' (INT 7).
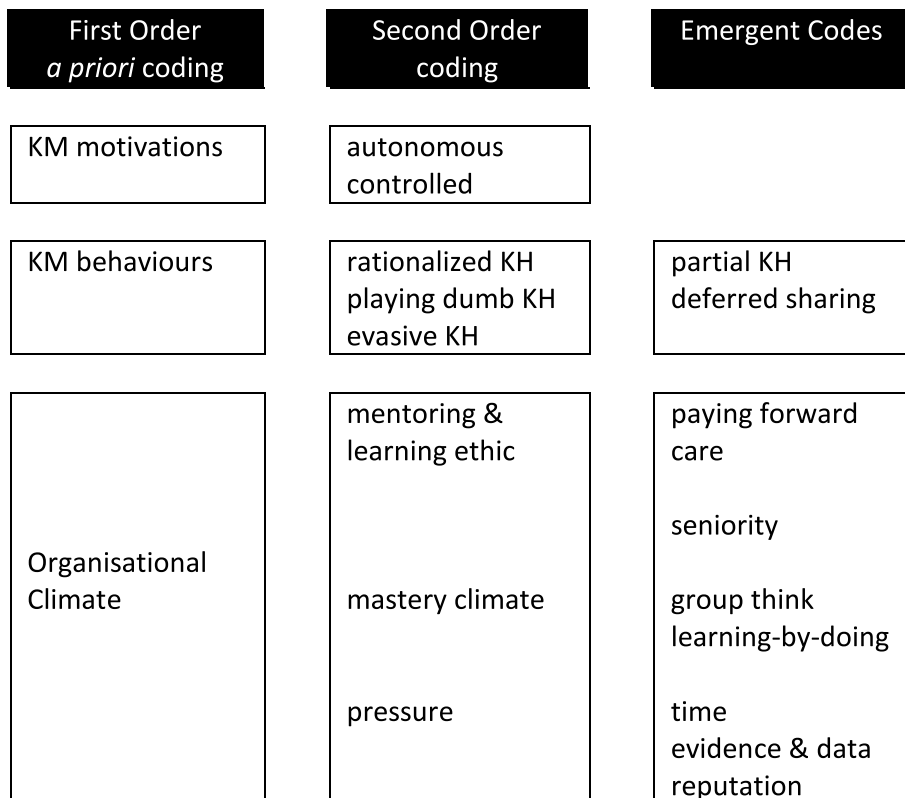

First Order *a priori* coding	Second Order coding	Emergent Codes
KM motivations	autonomous controlled	
KM behaviours	rationalized KH playing dumb KH evasive KH	partial KH deferred sharing
Organisational Climate	mentoring & learning ethic mastery climate pressure	paying forward care seniority group think learning-by-doing time evidence & data reputation

Fig. 2. Coding schema for data analysis.

Table 2
Knowledge Hiding actions co-exist with pro Knowledge Sharing motivations.

INT	Knowledge Hiding (KH) actions	Knowledge Sharing (KS) attitudes/ motivations
INT 3	'Or [I say] "I will have a look later" but leave it on the long finger, in which time they might have figured it out' [EVASIVE HIDING]	'I always see it if you help someone like that, it will work in your favour in the future. There will be a time when they know something you do not and I feel they will help you in the future.'
INT 4	'I also tell them I will get back to them. I do not really plan on it … also it makes me look like I am trying to help' [EVASIVE HIDING] 'you will just say you do not know' [PLAYING DUMB] 'just give them enough … to get them on their way … as they don't share with me fully' [PARTIAL HIDING]	'I believe that it is part of the job. But I believe it's [KS] just in the culture but it does benefit the group as things done faster.' 'personal motivator … it [KS] is for the greater good'
INT 6	"I will come back to you later, when I am further on or a 100%" [EVASIVE HIDING]	'The more people know something the better' 'Share as much as you can so you can do other things' I get a thrill out of helping people with things like that'
INT 7	'I will give them some bit … and so they think I am helping' 'you give the ones [ideas] that don't really have weight or just to participate while you are working in the background on what you really think will work' [PARTIAL HIDING]	'It [KS] then means you are taking time away from yourself. It's something then that you don't get recognised in your job for doing' 'I think it's [KS] part of the day-to-day job' 'Partly the enjoyment of it and kid of for the greater good. Because I don't see recognition out of it'
INT 8	'"I will get back to you on it later" That will buy me some time' [EVASIVE HIDING]	'It lessens the amount of work I have to do if someone else knows some of it. It frees me up basically' 'Enjoyment of it'
INT 9	'You might just answer the specific question asked and know that there is a better option or some more info needed and not share it as you were not asked for that bit of info' [PARTIAL HIDING]	'I do think it's [KS] critical. 'It's important, like what we are trying to do is build the best devices. If we are not sharing knowledge or withholding information then we might do damage to the progress and lose the opportunity to make something better' 'it does feel good to help'
INT 11	'You need to just pretend you don't know anything' [PLAYING DUMB]	'You're encouraged to share' 'If you want the reward you have to be seen to share'

4.2. Coexistence of knowledge hiding with knowledge sharing

The reports of practising and experiencing KH described above happen in an organisational and personal context where respondents uniformly reported very positive attitudes towards knowledge sharing (see Table 2). Knowledge sharing is seen as an important value, critical to the type of knowledge intensive work being done and an accepted part of the organisation's practices and culture. The organisation has knowledge management tools and systems, but knowledge sharing is viewed as largely a person-to-person exchange: "I do think we rely on going talking to people rather than a central hub for lessons learned" (INT 9). Knowledge sharing was tied explicitly to the organisation's mission to design and manufacture high technology healthcare products: "what we are trying to do is build the best devices. If we are not sharing knowledge or withholding information then we might do damage to the progress and lose the opportunity to make something better" (INT 9).

Support for knowledge sharing was universal across the engineers interviewed and a common view was that knowledge sharing should not need extrinsic support. In fact, the majority of engineers interviewed do not believe that the organisation rewards knowledge sharing but that it

is intrinsically driven. In line with the finding that knowledge management is a shared common value, autonomous (self-generated) motivation is the most commonly cited driver for sharing knowledge. Controlled motivation was seen in junior staff who are primarily motivated to share knowledge for self-interest, as a visible way of demonstrating their knowledge and skills to senior management. Mid-career and senior staff were motivated by the intrinsic pleasure of sharing their knowledge, describing the enjoyment of helping others. However, despite an organisational culture and personal values that are very positively in favour of KS, the findings show that knowledge sharing and knowledge hiding co-exist. Individuals can be both positively in favour of knowledge sharing and at times practice knowledge hiding.

4.3. Mentoring as a driver of both knowledge hiding and knowledge sharing

Respondents reported a very strong mentoring ethic that underpins knowledge sharing (see Table 3). This was present even in the junior

Table 3
Mentoring Ethic and associated Knowledge Hiding for reasons of care and protection.

INT	Mentoring Ethic	Knowledge Hiding reason
INT 4	'In some groups there are very, very young grads, and they are not given proper mentorship. But within my own it is.'	'You might not always be right, and it might be better to let others use their own brain. They could develop knowledge of greater depth then if you just give them the answer' [PROTECTING LEARNING]
INT 5	'I will always give my knowledge … Basically you found out the hard way and it's better to help others so you don't have to'	'You have to let people learn from failure, it helps them grow' [PROTECTING LEARING]
INT 7	'With younger engineers … it's nice to help them out. Especially as I have got so much over the years that I can pass on and share. It's good to pass it on'	'I think by telling not telling people some bits of information you help them to learn and progress on their own, but you cannot tell them it's a learning exercise so you might say you don't know the answer' [PROTECTING LEARNING]
INT 12	'In general I would share more with junior staff … and within the team'	'I think in some cases it is better not to share too much detail. Because you can fix someone's way of thinking as opposed to leaving it open ended … Sharing in some cases might be bad, as it might lead to group thinking' [PROTECTING LEARNING]
INT 8	N.A.	'I weigh it up like this, if it's not going to hurt anyone or cause a huge issue well then I will keep it [knowledge of a problem] to myself as others don't need to know' [PROTECTING JUNIOR STAFF]
INT 10	'I have mentored people over the years either through direct supervision or through people asking to be mentored for one thing or another. I always try and share the stuff that is not written down and not in the schoolbook. I would like to spare them the pain I went through, it makes it better for them. Happy do it really.' 'I am collaborative by nature and I love mentoring so I like to share what's in my head and taking from what I learnt going back all those years'.	'With my direct reports you might get some feedback and you have to filter it … It would only do damage to them. Would I chose to tell them what was said after they asked me? No, for that reason.' [PROTECTING JUNIOR STAFF]
INT 11	N.A.	"So, at the time, the knowledge can be sensitive and you need to just pretend you don't know anything as not to hurt someone or worry them." [PROTECTING JUNIOR STAFF]

engineers: "I would go out of my way to help the new starts as I have been through it" (INT 2). There is empathy with the huge learning task facing technical engineers as they progress, and this desire to support junior staff is expressed at all levels. The way this process is described supports the view of a mastery climate in the organisation. Engineers at all levels see themselves as learners and as learning mentors, in a climate where technical knowledge is prioritised: 'the organisation is very much focused on data-driven decisions, as opposed to theories' (INT 9). This can be associated with direct self-interest, as well as being in line with prevailing mastery climate. Career progress is related to being able to "showcase how much you have learnt and that you're progressing in your role" (INT 1). At senior levels the motivation to share knowledge is associated more with a values-driven approach that sees mentoring as something that should be done without needing a reward and knowledge sharing in a mentoring context, as both a pleasure and as something that aligns with their values: 'for the greater good and that was not how I thought if it when I was younger' (INT 12).

The mentoring ethic and mastery culture that promotes knowledge sharing can also be a motivation for knowledge hiding where knowledge is withheld in order to promote better thinking, either in the team or to promote learning-by-doing in junior staff. 'They could develop knowledge of better depth than if you just give them the answer' (INT 4). Alongside the motivation to help junior staff avoid the pain of learning, there is also a willingness to let junior staff learn from their mistakes and develop deeper knowledge. A related reason for hiding knowledge is to open up the opportunity for better thinking by the group, recognising that the requestee may not have the best answer, or their answer may shut down learning leading to group-think.

4.4. Knowledge development as a driver of knowledge hiding

Senior engineers describe a key reason for hiding knowledge as the need to protect a new idea while it is being developed and tested – we call this *deferred sharing* (see Table 4). With deferred sharing, the request for information is met with a KH strategy of evasion, playing dumb, or partial hiding in order to create time and space to develop the solution and provide the requested knowledge. For example: 'I even had a manager ask me if there is any way to fix this issue and I said "No, not that I can think of." … I needed to think about it for a while … I needed to run some tests to make sure I had all the answers.' (INT7).

As described above, the organisation valorises data in evaluating new ideas. Engineers use deferred sharing as they recognise that as the idea is developing and changing it may not be stable or robust enough to meet the organisation's standards. 'The moment of learning something new … is not the time to share, as its the period when your learnt knowledge will change the most' (INT 11). The idea is protected from external scrutiny until sufficient data has been collected, areas of risk identified and tested and the engineer is confident they can answer all questions. Before that point, some engineers reported that they would either give knowledge which is in line with what others are thinking or false knowledge if they had new knowledge which they did not fully understand or if others would not understand it readily.

KH behaviour can be driven for some by protecting themselves from the negative consequences of sharing an idea that is not yet fully developed. There is a perceived risk in presenting a new idea early that failure could damage the individual engineer: 'if the knowledge is so far out there or new, some might think you are mad' (INT 11). As well as making sure that an idea is robust and supported by evidence, there is also an awareness that an idea might not be successful unless it is presented to the right decision maker. KH is used to protect the knowledge until it can be shared at the most advantageous moment: 'If you tell the wrong people first it could just be killed off before it even gets going' (INT 7).

Table 4
Knowledge hiding to protect the idea (time to develop).

Position	KH reason
INT 4	'I might say "give me a few days and I will get back to you" because you need to have all the data'
INT 5	'Say you come up with an idea … you need to investigate it a bit first … to make sure it's going to work'
INT 6	'You want to keep your powder dry. You don't want to be saying something and it failing would look bad'
	'I would keep it to myself to make sure it was working and bullet proof'
INT 7	'I even had a manager ask me if there is any way to fix this issue and I said no not that I can think of'
	'I needed to think about it for a while … I need to run some tests to make sure I have all the answers. If you share early and you are wrong or don't have the answer to something then you just look mad, or they might question does she even know what she is doing'
	'We are data driven so you need to hold back to get the data really.'
	'There are times it has to be the right audience … So you might hold it back just to show support with team and not be seen as a non team player'
	'But if you tell the wrong people first it could just be killed off before it even gets going. So you need time to think who is the right audience really as well before sharing.'
INT 8	'If you tell someone it might mean you get called into planning meetings and project risk reviews and just slows you down really' 'I don't say it because it would slow me down' 'Until I have a clear answer I will not be forthcoming with information' '"I will get back to you on it later" That will buy me some time'
	'I am worried about how to communicate the results I got … I will not be able to stand up in front of management and say we have a problem and we don't know why its different'
INT 9	'just afraid to give the info without all the data'
	'They might be working on something that is too early to share yet … without all the data. … The organisation is very much focused on data driven decisions'
	'they have all the theory to say that it's ok or works, but they don't have the data'
INT 11	"Another factor for me, is the stress that knowledge sharing can bring … You might have to take action on something which is not fully there … and the need to deliver on it brings huge stress" 'If the knowledge is so far out there or new, some might think you are mad.'
INT 12	'For small amounts of time I would [KH]. I need to think it through but once I feel like I understood it more then I would share freely"
	'For me its just because I am an introvert I want to think it through to a certain level before I share publicly. Like for a few weeks or days. But the more I trust someone the more chance I will share openly with them regardless of if I have it worked through or not. … Even if it is not fully formed.'

4.5. Knowledge hiding as a response to stress and time pressure

The ethic of care in senior engineers is also given as a motivation for KH when the knowledge could harm the requester (see Table 3). Potential harm is a reason that has been theorised in the literature as a reason for rationalised hiding, but it has never been empirically investigated. Senior engineers report using partial hiding and playing dumb in order to protect their staff from hurtful feedback that the requestee has judged will not benefit the requester and may cause stress.. 'With my direct reports you might get some feedback and you have to filter it … It would only do damage to them. Would I choose to tell them what was said after they asked me? No, for that reason.' (INT 10).

People also reported using partial knowledge hiding in order to protect themselves from stress. This stress is identified as being the stress of sharing an idea that is not yet fully developed, and also the pressure that comes from having an idea formally evaluated. Engineers feeling this pressure would deploy deferred sharing until the idea is more advanced and is strong enough to stand up to evaluation.

The organisation is characterised as one subject to strong time pressures, where time is a scarce resource and this stress is described as having a negative impact knowledge sharing. A majority of the interviewed engineers believed that it can be hard to find time to share because of an emphasis on project milestones and that managers are not aware of the time needed for knowledge sharing. Deferred sharing is

used as a way to push back on time pressure to create a space to develop the idea until it is ready to be shared: 'when if you are left alone it will be sorted in a timely manner anyway' (INT 8).

In this group of professional knowledge-workers operating in context characterised by strong norms around learning, albeit tempered by time pressures, there is high autonomous motivation to share for the pleasure of learning and the presence of a strong mentoring ethic. Despite the high value placed on knowledge sharing, respondents also report having experienced and practiced KH. Motivations for practising KH are often pro-social and aligned with the same motivations that support KS: protecting emerging innovation, a climate of learning and care for staff.

5. Discussion

5.1. Implications for theory

Our findings provide evidence for pro-socially motivated KH. What is common across all extant empirical work is that KH is seen as a counterproductive workplace behaviour with negative causes and impacts (Connelly et al., 2019). There is only a small body of research that examines motivation and KH, and this literature has hypothesised that KH has is motivated by less desirable motivations, even "dark traits" (Pan et al., 2018), requiring the use of sanctions to manage its elimination. Desirable KS behaviour is associated with autonomous motivation, either intrinsically driven by an intention to achieve enjoyment or interest, or extrinsically driven by the desire for meaningful work (Gagné et al., 2019). Our findings show innovation employees working with complex knowledge who choose to hide this knowledge from requesters for reasons also related to autonomous motivation: they were motivated by a desire for better mentoring, to protect employees and themselves from negative consequences, and to advance a meaningful project. The antecedents of pro-social KH may not be different to those of KS, in contrast to the assumptions made in current literature (Connelly et al., 2012). Our research enlarges the existing view of KH to argue for the co-existence of negative KH with KH behaviour that has positive organisational impacts and is pro-socially motivated by autonomous motivation, similar to KS motivation.

Proposition 1. *Knowledge hiding can be pro-socially motivated and co-exisits with pro-knowledge sharing attitudes and motivations.*

The organisation where we carried out our research demonstrates many of the features that extant research suggests would reduce KH: complex, inter-dependent team work, a mastery climate that prioritises mentoring and learning, job autonomy with high levels of engagement, a strong knowledge sharing culture. Despite this we found that all respondents had observed or experienced KH, and many staff, usually more senior, had practiced KH. This stands in contrast to previous studies that identified a negative relationship between KH and age, tenure and social status. (Pan et al., 2016; Rhee and Choi, 2017). The literature has generally argued that the stronger the employee role – through commitment, positive team and supervisor relations, status as a senior with valuable contributions - the less likely that employee is to practice KH. Our study calls that relationship into question. In our study pro-social KH was practiced by more senior staff to protect, nurture and pace tacit knowledge. Organisational identification, being confident in your value to the organisation, is associated with mentoring behaviour, and has also been shown to be associated with lower KH (Peng, 2013). In our study, we found instead that mentoring behaviour was practised through both KS and KH – mentors may hide knowledge in order to foster learning in junior engineers, either to provide opportunities for learning by doing or to avoid group-think in teams. This suggests a more complex relationship affected by the role of pro-socially motivated KH in knowledge transfer exchanges.

Proposition 2. Pro-social knowledge hiding is practised by senior staff members as part of their mentoring of junior staff.

Territoriality and psychological ownership have also been shown to influence KH in R&D teams (Huo et al., 2016). Where someone feels personal investment and control of some knowledge, they may wish to

defend their territory through keeping the knowledge to themselves, even to the point of deliberately frustrating requests (Peng, 2013; Singh, 2019). Psychological ownership is positively associated with strong organisational identification (Peng, 2013). We saw this behaviour in senior R&D engineers who used deferred sharing KH to control the pace and timing of the early development of innovative ideas. Previous research found greater knowledge complexity to be associated with evasive hiding, and they took this to mean that the time and effort required for knowledge transfer deterred employees from sharing (Connelly et al., 2012). Our findings suggest that complexity may be associated with KH but for other, pro-social reasons. Although this was counter to the organisation's culture of KS, it was a response to another aspect of the organisation's norms: the importance of supporting new ideas with data and holding them to robust peer review.

Furthermore concepts of power and KH are challenged in our study. Riege (2005) theorises that a barrier to knowledge sharing is keeping knowledge to gain power. Several studies add weight to this theory (Davenport and Prusak, 1997; Wang and NOE, 2010; Černe et al., 2014). Others show that the loss of power from knowledge sharing is positively associated with KH (Hislop, 2013; Holten et al., 2016; Peng, 2013). However, this research shows that power may not be as strong a driver as previously reported in the literature. The deferred sharing KH behaviour was motivated by a desire to develop the innovative idea to the point where the knowledge could be shared, supported by evidence and defended. Rather than being an outcome of workplace ostracism or organisational cynicism (Zhao et al., 2016; Jiang et al., 2019), it was an outcome of strong workplace identification. Generation of creative new ideas, prior to validation and evaluation, is an important part of the innovation funnel, and one which R&D performing organisations want to promote (Huo et al., 2016). Although the behaviour is hiding knowledge in the short-term, it is pro-socially motivated and aimed at contributing to the organisation's innovation performance.

Proposition 3a. Pro-social knowledge hiding in the form of delayed hiding is used to create space for idea development refinement where strong project evaluation processes are used.

Proposition 3b. Knowledge hiding in the form of delayed hiding is used to create space for project development and idea refinement where strong time pressures exist.

Among our respondents, a very common KH strategy was partial hiding, providing some of the answer without fully sharing the knowledge requested. Partial hiding allows the responder to comply with KS norms, and potentially prevents the retaliation seen with other strategies (Černe et al., 2014; Connelly and Zweig, 2015), but has the same consequence that the requested knowledge is not fully shared. The phenomenon has been recognised in the literature, notably Connelly et al. (2019: 780) expand their definition of evasive hiding to include not just misleading information but also 'partial information or a misleading promise of a more complete answer in the future' but to date studies on KH have focussed on evasive hiding as avoiding honouring the request or provision of an incorrect answer, using the measure developed by Connelly et al. (2012) which does not include partial information. Our findings suggest that the wider definition of evasive hiding to include partial hiding warrants more investigation; KH is not just the frequency or act of hiding, but also the quality of the knowledge that is shared or hidden (Gagné et al., 2019). Time pressure has been identified as an antecedent of KH (Škerlavaj et al., 2018), and this was confirmed in our study, with partial hiding the common response to manage this pressure. The organisation's learning culture with strong norms in favour of knowledge sharing without management support for time to transfer knowledge led people to deploy partial hiding as a way of appearing to share while not losing work time to being too helpful.

Proposition 4. Partial hiding is another KH strategy used to avoid complying with a request for knowledge.

A final theoretical implication is to consider how we research

knowledge management behaviours and their motivation in the workplace. The literature on KH has been predominantly carried out by means of quantitative survey and experiment. The exception is the foundation paper that developed the indicators used in the field which included qualitative interview with employees to identify the types of KH (Connelly et al., 2012). Quantitative studies with hypotheses and indicators that are predicated on the assumption of a negative relationship between motivation, KH practises and organisational impacts can only prove or disprove these negative relationships, leading to calls for research to look directly at pro-social KH and also to use qualitative methods to investigate KH (Connelly et al., 2019). When an organisational concept is emergent, it remains important to be open to qualitative work that has the potential to surface deeper and more nuanced understandings of how a concept like KH is practised in complex settings (Gehman et al., 2018; Xiong et al., 2019). Our research shows that there is a much wider and richer range of KH behaviour, antecedent motivations and impact on innovation than has been previously identified.

5.2. Implications for practice

Our research shows that knowledge management for innovation is complex, with the potential for unintended consequences. Our research identified R&D staff who felt they needed to hide their early stage innovative ideas, in order to protect them while they were being developed. In common with many R&D intensive organisations, our research site had a mastery climate with learning and especially self-directed learning accorded a high status. It also has a very data-driven ethos, where proposals for innovation are expected to be evidence-based and subject to peer scrutiny. Finally, it has strong knowledge sharing norms that make knowledge hiding unacceptable and tie career progression to knowledge sharing. KH can be associated with an individual's strong confidence in their role as an organisational member, and a pro-socially motivated desire to foster learning. Organisational norms that stigmatise KH could undermine this development activity and erode the mastery climate; R&D managers may need to consider that not all KH is negatively motivated or counter-productive in its impact.

6. Limitations and future research

Knowledge hiding has been identified as a prevalent phenomenon across multiple sectors and cultures. Not much is known about the motivations for knowledge hiding, and much empirical work to date has focused on the negative impetus, forms and consequences of knowledge hiding behaviours. In this paper we interview innovation engineers in a technology-intensive industry about their experiences of knowledge management, knowledge sharing and knowledge hiding and identify pro-social motivations that add new depth to the current body of knowledge, in places contradicting long-held perceptions of KH developed over time in the KM literature. This study reflects the behaviours and motivations of R&D engineers in a single organisation with a specific knowledge management context. Controlling for context allowed us to focus on individual level explanations for KH looking at motivation that are intrinsically connected to contextual factors such as organisational norms and practices around knowledge management (Yin, 2013). A single case is a valuable tool for generating theoretical understanding and we offer our propositions as development of theory in this emerging area, that is as theoretical generalization (Tsang, 2014).

The findings suggest that KH can have a pro-social purpose, being carried out to protect, mentor, and develop people and ideas. In our study, level of seniority was a salient factor. Younger employees were motivated to share knowledge in order to build their reputation within the organisation. More senior engineers were, where appropriate, motivated to hide knowledge for the longer-term benefit of the organisation. The research extends the emerging field of KH by providing support for the importance of positive KH. It is important for organisations to recognise that pro-social knowledge hiding motivations may be

determining knowledge transfer behaviours and that this may have organisational advantages and support improved innovation and performance.

This expanded understanding of pro-socially motivated KH opens up a number of avenues for future research. It would be valuable to replicate this study across other R&D performing organisations, as well as different kinds of knowledge-intensive workplaces, in other national contexts, to see if these results are replicated and to test and establish the statistical generalizability of our propositions. Multiple case-study or survey designs could test the propositions advanced and provide estimates of the hypothesised relationships. It would be fruitful to know more about the perceived impact of pro-social KH on trust and reciprocity in the workplace. Prior research on KH has identified that rationalised KH is not perceived by knowledge requesters as a negative behaviour and the impact on work relationships is not detrimental. Does this also hold for deferred sharing KH? It would also be important to establish the impact of early stage KH on the final success of innovation projects. KH is perceived to protect early stage ideas while they are being developed but we do not know if this is true. Longitudinal, qualitative work that takes the innovation project as the unit of analysis could tell us a lot about the impact of pro-social KH on innovation performance. Finally, we need the development of an expanded quantitative instrument to measure KH and the incorporation of pro-socially motivated KH into study hypotheses in order to gain a fuller understanding of the complex relationships between motivation, KH and KS behaviour and organisational impacts.

Declaration of interests

One of the authors is an employee of the organisation where the data collection was carried out. There are no other interests to declare.

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