How internal attributions affect knowledge sharing behavior

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Abstract

Purpose – *The purpose of this paper is to compare the effects of organizational and technological barriers to knowledge sharing between large and small firms through the lens of attribution theory.*

Design/methodology/approach – *The structural equation modeling approach was applied to estimate the conceptual model by using survey data from a list of Taiwan's top 1,000 manufacturing and 500 service companies. A total of 229 valid questionnaires were collected.*

Findings – *The empirical results show that both organizational and technological barriers have relationships with an individual's effort and ability with regard to knowledge sharing behavior. When organizational barriers occur, the perceived lack of effort has a direct effect on knowledge sharing behavior for large firms, while negative sharing behavior among employees of small firms is influenced by the perception of low ability through the perceived lack of effort.*

Originality/value – *A review of the literature reveals organizational and technological barriers that lead to the negative influences of internal attributions on knowledge sharing. This study, therefore, contributes to a comprehensive perspective on how to encourage knowledge sharing behavior at different sizes of firms.*

Keywords *Knowledge sharing, Ability, Effort, Firm sizes, Internal attribution*

Paper type *Research paper*

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1. Introduction

Knowledge sharing is an important aspect of knowledge management, which can be an organization's sustainable competitive advantage. Through knowledge sharing, the organization could integrate both internal and external knowledge, detect opportunities and obtain more advantageous positions (Gavirneni *et al.*, 1999). Although knowledge sharing results in improved organizational effectiveness, few firms have been successful in encouraging staff to share their knowledge and facilitating their sharing capabilities to support the related activities.Organizations are confronted by a variety of knowledge sharing problems, which can eventually lead to resistance to knowledge sharing behavior, such as barriers within organizations, a lack of technological resources and training, as well as differences in individuals' skills (Riege, 2005). Moreover, another factor determining knowledge sharing's success or failure is an individual's motivation to participate in community knowledge generation and sharing activities (Jolaee *et al.*, 2014).

Several studies have investigated the potential barriers to knowledge sharing in virtual teams (Lin *et al.*, 2012; Rosen *et al.*, 2007), virtual communities of practice (Usoro *et al.*, 2007) and different knowledge sharing mechanisms (Bontis *et al.*, 2009). One of the most important barriers to effective knowledge sharing within a firm is a lack of organizational support for knowledge transfer efforts and abilities (Alavi and Leidner, 2001; Riege, 2005). A lack of factors that motivate and encourage employees can prevent staff from feeling self-efficacy and using their full potential. Michailova and Husted (2003) suggested that when the level of organizational support provided through the social environment is adequate, a

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high level of perceived self-efficacy will encourage the pursuit of effective knowledge sharing. For example, Wang and Noe (2010) suggested that the use of appropriate supervisory control in the organization was a significant predictor of individual effort and ability, which were also related to the frequency of knowledge sharing. It can be assumed that self-efficacy may be fundamental to the individual's willingness to perform desirable behaviors. The process of sharing knowledge is, thus, endangered at the individual level as sharing may weaken a person's position in the firm, such as by threatening their job security and making them lose their unique knowledge within the organization. There can be internal attributions that ascribe the causes of such behaviors to personal dispositions, efforts, abilities and feelings about knowledge sharing, and these can reduce the willingness to achieve common goals through knowledge sharing.

In addition, size is an important variable that affects organizational factors such as the organization's culture, climate and degree of capital expenditure. Connelly and Kelloway (2003) mentioned that the size of organizations influences the effectiveness of knowledge sharing activities in and between business functions. Firm size is also a moderator that can have a significant impact on IT competency and performance (Wu and Chiu, 2015). However, existing research suggests that as firms grow, they develop formal administrative systems, structures, norms and values that slow their capabilities to recognize and adjust to shifting environmental conditions (Leiblein and Madsen, 2009). Large firms can foster technological innovation more efficiently than small firms (Abernathy and Utterback, 1978). It is also argued that large firms benefit from the more efficient use of equipment and specialized technical personnel, as well the greater resources to fund projects (Porter and Kramer, 2002). Lee and Xia (2006), further, supported this claim by stating that research has been consistent in its findings on the impact of organizational size on information technology innovation adoption. Although some scholars have made contributions to the literature on the size of the organization in terms of providing insights for its impacts on organizational performance, none of them has successfully illustrated the interwoven nature and reciprocal relationship between an individual's self-efficacy and knowledge sharing behavior in different sizes of organization.

Recent developments in the literature on knowledge sharing behavior, especially in organizations of different sizes, have shown that the unidirectional approach adopted in most studies is not sufficient for building comprehensive theories. Therefore, investigating the internal attributions in relation to the motivation of employees to share knowledge is important to explain a wide range of workplace behaviors. This study, thus, intends to explore the relationships among the barriers to organizational support and individual motivation, and how these affect knowledge sharing behavior in the different sized organizations. As such, we developed a model and tested causal factors, which include the organizational and technological barriers that influence employees' efforts and abilities to share knowledge across different sizes of firms. The results offer valuable insights for both managers and employees with regard to managing resistance to knowledge sharing, conceptualized and grounded on an attributional perspective of achievement motivation.

2. Theoretical development

2.1 Causal analysis of knowledge sharing barriers

Organizational context is one of the critical barriers to knowledge sharing activities (Huysman and Wulf, 2006), and organizational barriers are those that arise from within the organization, and these may be of many types, such as a negative organizational climate and culture, absence of communication policy and excessive layers of authority. Organizational context, in this work, refers to the effects of organizational characteristics on the decision to adopt knowledge sharing. Given that the focus of this study lies on quantitatively assessing employees' perceptions of their organizational context, we follow Denison (1996) and refer to the salient institutional structures as the organization culture

and climate. The organizational culture and climate are the basic assumptions, values, norms and psychological environment, as reflected in the attitudes and perceptions that encourage and discourage knowledge sharing (Chien *et al.*, 2013; Koh *et al.*, 2014; Yao *et al.*, 2015). For example, some studies have shown that organizational culture, management support and friendly relationships among employees may also shape the motivation to share knowledge (Chang and Chuang, 2011; Michailova and Minbaeva, 2012). This is consistent with the work of Riege (2005), which showed that organizational barriers tend to be linked to, for instance, a firm's culture and climate, lack of infrastructure and resources, the accessibility of formal and informal meetings and general economic viability. Furthermore, a number of studies have highlighted the problems in knowledge sharing that arise owing to organizational barriers, which may make individuals not to share their knowledge, or hesitate to do so. For example, Szulanski (2002) noted the problem of the stickiness of knowledge among group members. Individuals may, thus, hesitate to share their knowledge because they fear losing ownership of it, and so a position of privilege, or else they may lack the time needed to communicate or feel there are insufficient rewards for doing so. Therefore, an organizational context can have a strong impact when employees develop shared knowledge and shared perceptions about what behaviors are expected within the organization.

Another significant barrier to knowledge sharing is from technological challenges (Kim and Lee, 2006; Lin *et al.*, 2012; Ranjbarfard *et al.*, 2014; Riege, 2005). Technological resources can act as a facilitator to encourage knowledge sharing activities by establishing a system to enables the flow of knowledge, as well as the communication flows that help in maximizing the value of knowledge (Ajmal *et al.*, 2010). Riege (2005) claimed that the use of technology may enhance individuals' motivation for knowledge sharing, as it could remove temporal, physical and social distance barriers and reduce those to formal communication. Without technology, it is difficult to collect and analyze data, as well as generate and distribute knowledge. Technological barriers are related to factors such as a lack of information systems and technology, an unwillingness to use technology owing to a mismatch with one's requirements and difficulties in building and integrating technology-based systems (Riege, 2005). In addition, technological barriers may occur as a result of setting unrealistic expectations for IT-based solutions. Moreover, employees often focus on the technology rather than on how it should operate (Benbya, 2008). Especially when there is lack of compatibility and standard approaches to IT deployment, difficulties can arise when developing an efficient knowledge transfer system. Technological resources can, thus, become a barrier, unless there is a close fit between these and employee requirements (McLaughlin *et al.*, 2008).

As noted above, employees will form causal attributions in knowledge sharing situations in relation to both individuals and groups. We, thus, argue that organizational and technological barriers are critical in effectively shaping causal attributions, which are linked to the motivation to engage in knowledge sharing behavior.

2.2 Attribution theory

Attribution research has primarily been used in the discipline of social psychology to understand how people attribute the causes of actions to a person, the environment or both (Heider, 1958). Weiner (2006) expanded attribution theory to explain social motivation based on cultural and social changes, and focused on self-attribution, studying how individuals interpret their own achievement outcomes and exploring the determinants of behaviors within the model of achievement motivation (Weiner, 1972). Within this theoretical perspective, individuals analyze and identify the antecedents and consequences of attributions to either the self or someone/something outside the self to maximize their understanding and prediction of events in their environment.

During the past two decades, there has been a large amount of research on attribution processes, mostly related to the understanding of individual and organizational behaviors. Moreover, attributions not only influence behavior, but also produce emotional or affective reactions and alter an individual's expectations about the self and others. For example, Martinko *et al.* (1996) proposed an attributional explanation for an individual's resistance to information, technology including how a person makes attributions for failed as well as successful experiences with such technology. By gaining a better understanding of the causal factors leading to an event, individuals can modify their behaviors and control the possibility of the future occurrence of the event. Martinko *et al.* (1996) also proposed procedures for decreasing individual resistance to adopting information technologies. Because of attribution theory's remarkable achievement in developing a predictive behavioral model, it has been applied to a wide variety of research fields, including psychology, motivation, management and organizational learning.

Attribution judgments have important implications for motivated behaviors as outcomes attributed to external, uncontrollable factors are less likely to motivate action than those attributed to more internal, controllable ones (Weiner, 1972). The basis of attribution theory is that people want to know the reasons for actions that they and others take, and it is intended to help understand the causes of human behavior. This allows people to assume some feeling of control over their own behaviors and over a situation. From this perspective, the aspect of attribution theory that seems to be particularly relevant to the issue of reactions to knowledge sharing is the inference of causation of outcome in the motivation of employees to engage in knowledge sharing behavior. Therefore, within the context of the present paper, attribution theory may help extend this stream of research into a deeper understanding of the psychological and motivational factors presumed to influence knowledge sharing behavior by identifying the *locus* of causality.

2.3 Effort and ability as internal attributions

With respect to attribution theory, the consequences of the evaluation of causal factors are internal attributions, and these are because of an individual's psychological state, and are cognitive in nature (Weiner, 1985). Attribution theory suggests that when an individual identifies the causal factors of work performance, they believe that they can successfully act upon these and improve their work-related outcomes.

Effort and ability are based on the perception and evaluation of a psychological state, which is likely to result from individual beliefs (Bandura, 1993). The concepts of ability and effort are logically interdependent. Effort is the "trying" component of a behavior, which is an internal and controllable factor, while "ability" refers to what a person can do or perform in relation to a task, and is the degree to which he/she possesses all of the psychological attributes necessary for a high level of performance, such as intelligence and capability (Weiner, 1972). In achievement contexts, success may be attributed to high ability and/or effort, while failure is perceived as owing to low ability and/or lack of effort (Weiner, 1972). Moreover, effort and ability are both important internal causal attributions of success and failure, which locate the cause of a behavior within a person, while causal schemata are used by the individual to reach inferences about the cause of success and failure (Natale *et al.*, 2009; Williams, 2013).

Some researchers have examined the effect of the interaction between organizational support and employees' effort and ability on performance in learning tasks. Kanfer and Ackerman (1989) examined a model describing how performance is driven by effort, which is seen as the attention people put on into tasks, the division of attention among on-task, off-task and self-regulating activities and motivation. Furthermore, if a person lacks the ability to invest significant resources in knowledge, they may be simply incapable of developing the necessary degree of commitment and ownership toward any new knowledge they may receive to allow for its full internalization (Cummings and Teng, 2006).

As such, attribution theory postulates that individuals' effort and ability can increase their own motivation by encouraging them to engage in a number of self-regulatory behaviors, which results in mediating cognitions that, in turn, determine the effective response of the individual behavior, such as setting appropriate and achievable goals, and monitoring and evaluating progress toward these. Therefore, to the extent that attribution theory has been applied to knowledge sharing research, we propose that the perception of effort and ability based on individual beliefs are psychological consequences that may allow better understanding of the development of knowledge sharing behavior. Here, knowledge sharing behavior is viewed as the degree to which employees actually share their knowledge with colleagues (Ryu *et al.*, 2003).

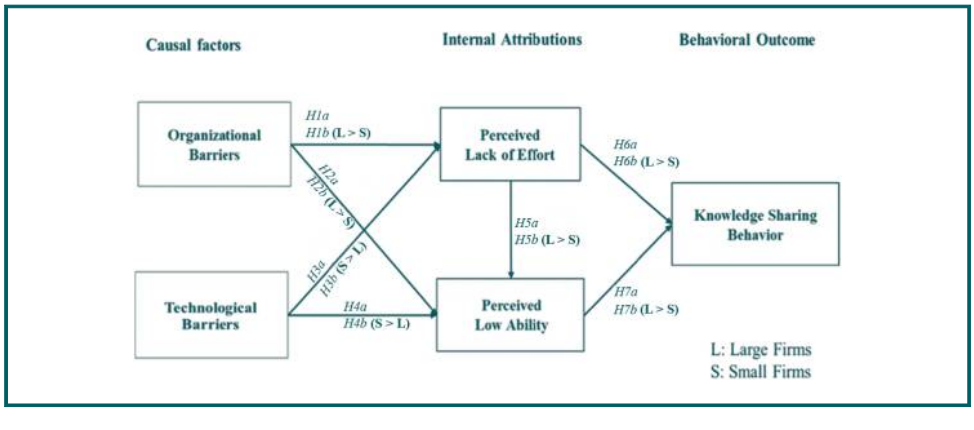
3. Research model and hypotheses

This study developed a research model to examine and compare the effects of organizational and technological barriers as causal factors on employee effort and ability in relation to knowledge sharing in both large and small firms. The research model is based on attribution theory, which is a widely accepted model for validating individual and organizational behavior. Figure 1 shows that perceived lack of effort and low ability are seen as internal attributions that mediate the relationship between organizational and technological barriers and knowledge sharing behavior, including the moderating effects of firm sizes on the relationship. The research hypotheses are discussed in the following sections.

3.1 The effects of organizational and technological barriers on internal attributions

Organizational barriers could have direct effects on individual beliefs about knowledge sharing. On the basis of self-efficacy theory, individual beliefs are related to the expected consequences of one's own behaviors (Bandura, 1997). Effort and ability are the basic determinants of a person's beliefs in their own capabilities to organize and execute the courses of action required to manage certain situations (Bandura, 1997), and could be potentially important factors influencing the decision to share knowledge. Schermerhorn *et al.* (1990) suggested that the actual level of work performance results from the various forms of organizational support, along with an individual's efforts and abilities. As such, organizational support, effort and ability are related constructs. Furthermore, social exchange theory suggests that effort in this context is an individual's willingness to contribute knowledge and this should have a direct relationship with the amount of organizational support that an employee perceives (King and Marks, 2008). For example,

Figure 1 The research model



employees are attracted to well-paying jobs and will expend extra effort to perform activities that bring them more pay, and become agitated if their pay is threatened or decreases (Stajkovic and Luthans, 2001). Additionally, ability represents an individual's skills or knowledge base related to an action. In line with motivation-opportunity-ability theories, organizational psychologists have emphasized that ability is an important moderator of the relationship between motivation and performance (Reinholt *et al.*, 2011).

Technology is one of the most important factors that support the efforts of public sector agencies to generate, integrate and transfer information and knowledge among agency networks (Kim and Lee, 2006). Logically, a high degree of technology elicits more favorable employee attitudes and beliefs, which will lead to greater effort and ability with regard to executing certain actions (Igbaria *et al.*, 1996). However, even if technology is important in driving knowledge sharing, it may fail to have this effect in some organizations. For instance, in a knowledge-sharing context employees may try to take up the challenge of using a more complex technology, but some will still be reluctant to use modified or newly introduced systems. Kukko and Helander (2012) noted that there are many different technologies in use and that when these are combined in companies they may even be incompatible with each other. It, thus, seems reasonable that employees may feel reluctant to use new technologies, and this could lead to employees' perceived lack of effort and ability with regard to knowledge sharing. As such, we argue that technologies can increase or decrease employees' efforts and abilities in this context. Technology can, thus, be a potential barrier to greater effort and ability. We, therefore, expect technological barriers to decrease both effort and ability in relation to knowledge sharing behavior. These are ideas are stated in the following hypothesis:

H1a. There is a positive relationship between organizational barriers and employees' perceived lack of effort.

H2a. There is a positive relationship between organizational barriers and employees' perceived low ability.

H3a. There is a positive relationship between technological barriers and employees' perceived lack of effort.

H4a. There is a positive relationship between technological barriers and employees' perceived low ability.

3.2 The effort and ability relationship

There are two different views of the relationship between effort and ability. First, the inverse rule is the belief that effort and ability are related inversely, that is, the less one's ability, the more one has to make an effort to achieve success. Second, the positive rule is the belief that effort and ability are related positively, that is, the more one exerts effort, the greater one's ability (Lam *et al.*, 2008). Some researchers suggest that whether effort and ability are seen as having a positive or negative relationship may be the result of different cultures. Regarding the concepts of effort and ability related to academic achievement, the belief that applying greater effort is the main way for improvement and fulfillment is pervasive in Asian cultures. Asian people view differences among individuals to be basically the result of life experiences rather than innate abilities, and so Chinese children, in particular, accept the philosophy that the major path to success is through effort (Han, 1996). As compared to the Chinese, the Americans are more likely to believe that ability is innate, while the Chinese, on the other hand, hold stronger beliefs that hard work is a major contributor to accomplishment and competence (Bond *et al.*, 1982). Furthermore, effort is important in the early stages of learning and developing a skill or ability, with greater effort linking success to an individual's ability and better results (Schunk, 1983). Knowledge sharing is a type of organizational learning system, and beliefs about the relationship between effort and ability have been reported to influence patterns of learning. Therefore, we assume that more effort

would engender greater ability in knowledge sharing behavior for employees who see a positive relationship between the effort and ability. This is stated in the following hypothesis:

H5a. There is a positive relationship between employees' perceived lack of effort and employees' perceived low ability.

3.3 The effects of internal attributions on knowledge sharing behavior

We propose that self-efficacy, seen in terms such as effort and ability, impacts employees' knowledge sharing behavior. Self-efficacy plays an important role in decisions about what behaviors to undertake by influencing individuals' motivations and behaviors (Bandura, 1982), and the amount of effort and ability that people are willing to put forth when faced with problems. A direct relation between self-efficacy and knowledge sharing has been established and attributed to the intrinsic and extrinsic motivations arising from the positive feelings that occur when employees believe that they have the ability to accomplish something (Connelly *et al.*, 2014). Consistent with attribution theory, we expect that an employee's effort and ability are internal attributions which serve as causes of knowledge sharing behavior. Organizational and technological factors, as a source of causal motivations, may alter how individuals engage their effort and ability with regard to knowledge sharing behavior. Furthermore, internal attributions can exert powerful effects on motivation. Hence, if attributing inadequate support and motivations to internal causes is the root of a lack of effort and ability, then effort and ability can act as an explanatory mechanism for the effects of internal attributions on knowledge sharing behavior. These ideas are stated in the following hypotheses:

H6a. Employees' perceived lack of effort has a negative effect on knowledge sharing behavior.

H7a. Employees' perceived low ability has a negative effect on knowledge sharing behavior.

3.4 The firm size effect for knowledge sharing behavior

Size is an important variable that affects many organizational factors. Some studies note that the size of organizations and functional areas influence employees' self-efficacy with regard to knowledge sharing activities (Chiaburu and Marinova, 2005). As discussed in the introduction to this paper, an important question for knowledge sharing studies is how organizational size is related to internal attributions and knowledge sharing behavior. Few people, however, have clearly examined or illustrated the relationships among size, self-efficacy and knowledge sharing with convincing evidence.

Many scholars assert that large organizations are more likely to perform better owing to the greater resources available. However, Baumann-Pauly *et al.* (2013) suggested that as firms become larger they, develop norms, values and intra-organizational social networks for their operations that have greater structural complexity. There are two reasons that would explain why large firms would have a stronger effect of organizational barriers on employees' perceived lack of effort and low ability than seen in small firms. First, based on the theories of equity, distributive justice and relative deprivation, perceptions of equity are established through a process of social comparison (Zenger, 1994). When a firm gets larger, failure to establish perceptions of fairness with regard to management control can result in a variety of negative outcomes for the employer, including interpersonal conflict and low effort and ability. Second, seen from the organizational resources perspective, larger firms seem to have an absolute advantage in their development. However, as the size of the organization grows, the firm's operations are more complex, including in terms of organizational structure, location and human resources, which also reduces the flexibility within the organization (Riege, 2005). Size can, thus, create structural inertia, and interpersonal

relationships and communication then start to break down, reducing employees' personal efficacy with regard to knowledge sharing (Bontis *et al.*, 2007; Forés and Camisón, 2016). By contrast, smaller firms differ from larger ones in their managerial style, independence, ownership and scope of operations. Generally, small firms have greater flexibility because of their more concentrated decision-making authority and shorter information structures and, thus, a faster ability to adapt to a changing organizational environment (Ruzzier and Ruzzier, 2015). Perhaps the most critical strength of small firms is the lack of an entrenched bureaucracy that often characterizes large companies, as this can lead to communication inefficiency, inflexibility and loss of managerial coordination. In the context of knowledge sharing, small firms tend to provide an environment this is conducive to generating knowledge. This is mainly owing to their small size and often single site location, which results in closer social relationships among employees, as well as good communication flows and greater knowledge sharing.

However, it has been noted by researchers that firm size is a contextual or enabler variable in the use of technologies and that it is common for small firms to lag behind larger ones in implementing new technologies. Lee and Xia (2006) proposed that small firms suffer from resource poverty and tight IT budgets, a lack of IT personnel and expertise and short-range management perspectives, resulting in more barriers to developing the capabilities needed for successful technology adoption. Moreover, they claimed that large firms are more flexible and more likely to perform better because of the amount of technological facilitation available to such organizations. Moreover, the diversity of specialists and technologies that are inherent in large firms are more likely to ensure fresh ways of formulating and attacking problems (Verdú-Jover *et al.*, 2006). This advantage is not available to small firms that have only a few such professionals and, thus, have fewer chances of these developing new approaches. Knowledge sharing is another key issue in enhancing innovation capability of firms, and this tends to be greater at smaller rather than larger firms (Bontis *et al.*, 2009). For all these reasons, we argue that technology is more likely to affect employee effort and ability for small firms as compared with large ones.

As mentioned above, although technological barriers are more likely to affect employees' effort and ability at smaller firms, the staff at such firms is also more likely to share knowledge. Moreover, causal ambiguity about performance responsibility is more likely to arise in large firms, leading to disputes over this issue. As such, in a large firm, making less effort has a greater impact on employees' ability to carry out knowledge sharing than in a smaller firm. Individual efficiencies are influenced by a wide range of factors, including not only the cognitive characteristics of individual internal attributions, such as effort and ability, but also the size of the firm. In light of the above insights, perceived low ability and lack of effort negatively affect knowledge sharing behavior as firm size increases. We, thus, propose the following hypotheses:

H1b. The effect of organizational barriers on employees' perceived lack of effort is stronger for large firms than for small firms.

H2b. The effect of organizational barriers on employees' perceived low ability is stronger for large firms than for small firms.

H3b. The effect of technological barriers on employees' perceived of lack of effort is stronger for small firms than for large firms.

H4b. The effect of technological barriers on employees' perceived low ability is stronger for small firms than for large firms.

H5b. The effect of employees' perceived lack of effort on employees' perceived low ability is stronger for large firms than for small firms.

H6b. The effect of employees' perceived lack of effort on knowledge sharing behavior is stronger for large firms than for small firms.

H7b. The effect of employees' perceived low ability on knowledge sharing behavior is stronger for large firms than for small firms.

4. Research method

4.1 Measurements

This study used paper and online questionnaires to collect data. The instrument developed for measuring the constructs in the research model is summarized in Table I. The causal factors of knowledge sharing barriers, internal attributions and knowledge sharing behavior, as well as all the indicators, were measured on a Likert-type scale ranging from 1 (strongly agree) to 5 (strongly disagree), as briefly described below:

- *Causal factors*: This part of the questionnaire examines the two main factors of barriers to knowledge sharing, namely, the organizational and technological barriers. Organizational barriers are measured using nine items, which are task structure, organizational structure, top management support, time and interaction and environmental factors. The measurement items were adapted from Yang and Farn (2009) and Lin *et al.* (2012). For the technological barriers, there are six items, which are

Table I Constructs and items

Constructs	*Items*
Organizational barriers	
ORB-1	My company's culture is not conducive to knowledge sharing
ORB-2	My company's organizational structure is not conducive to knowledge sharing
ORB-3	My company's geographic fragmentation is not conducive to knowledge sharing
ORB-4	The time and resources for knowledge sharing in my company are limited
ORB-5	My company has a lack of organizational incentives for knowledge sharing
ORB-6	My company has a lack of complete or standard regulations about knowledge sharing
ORB-7	My company is not conducive to knowledge sharing because of problems with authority
ORB-8	In my company, the knowledge providers and receivers lack contact time and interactions
ORB-9	In my company, differences exist in experience level between knowledge providers and receivers
Technological facilitation barriers	
TFB-1	My company has a lack of tangible communication mechanisms, e.g. telephone, discussion rooms or computer networks
TFB-2	My company has a lack of integration of IT systems and processes
TFB-3	My company has a lack of compatibility between diverse IT systems
TFB-4	My company lack in providing training regarding new IT systems for employees
TFB-5	My company lacks communication with employees about the advantages of the new system
TFB-6	My company lacks in providing systematic knowledge documentation for employees
Perceived lack of effort	
EFF-1	I feel that knowledge sharing wastes my time
EFF-2	I often forget the newly acquired knowledge
EFF-3	I don't love to accept new knowledge
Perceived low ability	
ABI-1	I feel my knowledge sharing skills are poor
ABI-2	I lack the absorptive capability needed to acquire new knowledge
ABI-3	I lack familiarity and experience with new IT systems
Knowledge sharing behavior	
KSB-1	I often share official documents and reports related to work with colleagues
KSB-2	I often share archives and organize notes with colleagues
KSB-3	I often share experiences and know-how with colleagues

related to infrastructure, IT systems, training in IT systems and systematic knowledge documentation, and the related measurement items were adapted from by Lin and Lee (2004) and Lin *et al.* (2012).

- *Internal attributions*: This part measures the two negative self-efficacy beliefs, namely, perceived lack of effort and perceived low ability, with three items each. Both of these factors are related to emotions, which are instigated by causal attributions of failure, implying that the self, other persons or situational factors produced this lack of success, and the measurement items were adapted from McDonald and Siegall (1992) and Lin *et al.* (2012).
- *Behavioral outcome*: Knowledge sharing behavior is defined as the degree to which employees self-evaluate how much they actually share knowledge with others. The three items used to measure the degree of knowledge sharing behavior were adapted from Yang and Chen (2007) and Lin *et al.* (2012).
- *Moderating variable*: The key variable, the firm size, was measured by the number of employees in the organization. This measure of size is consistent with the current Small Business Administration (SBA) classification scheme for manufacturing firms. We divided firms into small and large ones. Firms with fewer than 500 employees were considered small, while those with at least 500 employees were defined as large (Acs and Audretsch, 1988).

4.2 Data collection and sample

To better understand the barriers to knowledge sharing in Taiwanese firms, the sample used in of this study comes from a list of Taiwan's top 1,000 manufacturing and 500 service companies in 2012, as published by *Common Wealth Magazine* in 2013. The information was gathered through self-administered online and paper questionnaires, between on March 3, 2014 and April 2, 2014. The paper questionnaires were issued to the sample population via personal connections. As our survey was conducted in Chinese-speaking organizations, we strictly followed the translation–back-translation procedure, and two independent bilingual individuals translated all the scales from English to Chinese, and then back-translated these to English, to ensure equivalency of meaning. A letter explaining the research objectives was mailed along with the questionnaire to the companies. The online questionnaire was sent by e-mail to the sample firms' managers.

A total of 253 respondents returned usable responses. Twenty-four responses were excluded because of the extreme scores on multiple variables, and thus. a total of 229 responses were included in the final analysis. There were 55.46 per cent male respondents and 44.54 per cent female respondents. In terms of the level of education, most of the respondents had at least a bachelor's degree. The majority had less than five years of work experience. In terms of job position, 50 per cent were specialists, followed by team leaders and managers. Nearly 60 per cent of the respondents worked in manufacturing firms, and the rest in service firms and other industries. Of the total of 229 respondents, 82 worked in small firms with less than 500 employees and 142 worked in large firms. Table II shows the demographics details of the respondents.

5. Analyses and results

The research models were analyzed using a latent structural equation modeling technique, the partial least squares (PLS) approach. PLS is an advanced statistical method that allows optimal empirical assessment of a structural model together with its measurement model, which links each construct with a set of indicators measuring that construct. For this study, the PLS model was created in SmartPLS 3.0 to test the research hypotheses. PLS was appropriate for the data analysis in this study because it maximizes the variances explained

Table II Demographics details of the respondents

Basic information	Firm size		Total	
	Large (n =142)	Small (n = 87)	Frequency	(%)
Industry type				
Manufacturing	82	52	134	58.52
Service	48	28	76	33.19
Others	12	7	19	8.29
Work experience				
<5 years	79	46	125	54.59
5-10 years	20	18	38	16.59
11-20 years	15	9	24	10.48
21-30 years	23	11	34	14.85
>30 years	5	3	8	3.49
Educational level				
High/vocational school	1	1	2	0.87
Junior college	15	9	24	10.48
College	66	51	117	51.09
Graduate School	60	26	86	37.56
Position				
Manager, Director	25	19	44	19.21
Team Leader, Chief	35	16	51	22.27
Specialist	74	41	115	50.22
Others	8	11	19	8.30
Gender				
Male	80	47	127	55.46
Female	62	40	102	44.54

in the dependent variables, and it is less demanding in terms of sample size. Furthermore, the assumption of multivariate normality does not restrict the use of PLS.

5.1 Measurement model

The power of the measurement model can be demonstrated through measures of construct reliability and convergent validity (Hair *et al.*, 1998). Construct reliability is assessed using Cronbach's alpha, and the convergent validity of the resulting measures is assessed by the three criteria suggested by Fornell and Larcker (1981).

1. reliability of indicator loadings;
2. composite reliability of constructs (CR); and
3. the average variance extracted (AVE) from the constructs.

The assessment of discriminant validity involves checking whether the indicators measure only the focal construct or also other constructs.

We carried out a reliability assessment using Cronbach's alpha. The Cronbach's alpha coefficients for all constructs were above 0.7 for both large and small firms, with a score of 0.7 indicating adequate reliability (Hair *et al.*, 1998). The composite reliabilities of the constructs ranged from 0.82 to 0.94 for the large firm model and 0.81 to 0.95 for the small firm model; all constructs higher than the recommended level of 0.7 were deemed to be reliable. Convergent validity was assessed using the bootstrapping procedure. All indicator loadings for the large and small firm models were significant and exceeded the acceptable value of 0.5 recommended by Hair *et al.* (1998). Furthermore, the AVE ranged from 0.55 to 0.72 for the large firms and 0.59 to 0.75 for the small firms, exceeding the threshold value suggested by Fornell and Larcker (1981), and thus, the measures have good convergent validity.

Discriminant validity was demonstrated when the square root of the AVE was greater than the inter-construct correlations, as suggested by Fornell and Larcker (1981). Table III shows the correlation matrix, with the correlations among constructs and the square root of the AVE on the diagonal. The diagonal values for both groups exceed the inter-construct correlations, and thus, all constructs exhibited acceptable discriminant validity.

5.2 Structural model

We estimated two models, one for all samples and the other to one for compare the large and small firm groups. A bootstrap analysis was performed with 500 resamples, with the sample size equal to the large and small firm sample sizes (n = 142 and n = 87, respectively). Figure 2 shows the path coefficients and the explained construct variances, while Table IV presents the path coefficients and t-values for each path.

With adequate measurement models, the hypotheses were tested by examining the structural models. The explanatory power of the structural model was evaluated by looking at the R^2 value (variance accounted for) in the final dependent construct (knowledge sharing behavior). In this study, the final dependent construct had an R^2 value of 0.187 for the all samples, 0.207 for the large firm group and 0.160 for the small firm group. As previous studies could explain no more than 14 per cent of the variance in decision makers' willingness to continue a project (Keil *et al.*, 2000), the results indicate that the structural models proposed in this work have sufficient exploratory power.

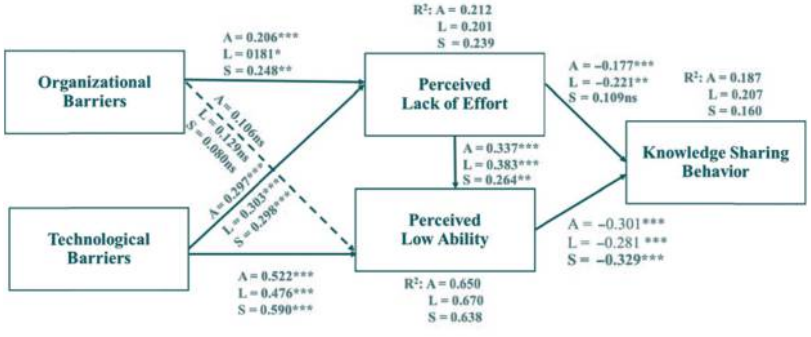
As hypothesized, organizational barriers exhibited significant effects on perceived lack of effort (β = 0.206, $p < 0.01$), but perceived low ability (β = 0.106, not-signification) did not. As such, *H1a* was supported, but *H2a* was not. Furthermore, technological barriers had strong effects on perceived lack of effort (β = 0.297, $p < 0.01$), and perceived low ability

Table III Square of correlations between constructs (all sample/large/small firms)

Constructs	*ORB*	*TFB*	*ABI*	*EFF*	*KBS*
ORB	*0.78/0.80/0.81*				
TFB	0.66/0.70/0.60	*0.85/0.85/0.87*			
ABI	0.59/0.61/0.53	0.74/0.72/0.72	*0.75/0.74/0.77*		
EFF	0.40/0.39/0.43	0.43/0.42/0.44	0.61/0.64/0.57	*0.77/0.78/0.78*	
KSB	−0.45/−0.52/−0.33	−0.32/−0.36/−0.25	−0.41/−0.42/−0.39	−0.36/−0.40/−0.29	*0.83/0.85/0.80*

Note: The diagonal elements (in italic) represent the square root of the AVE

Figure 2 PLS test of the proposed structural model



Notes: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$; ns: not signification; A: all samples; L: large firms; S: Small firms

Table IV Path coefficients and *t*-values and tests of differences between large and small firms

Path	*All sample coefficient (t-Value)*	*Large coefficient (t-Value)*	*Small coefficient (t-Value)*	*Comparison of group paths (t-statistic)*	*Outcome (Differences between the groups)*
H1a,b. Organizational barriers → Perceived lack of effort	0.206 (2.753)	0.181 (1.818)	0.248 (2.191)	–4.473***	*Not supported* (Stronger effect for the small group)
H2a,b. Organizational barriers → Perceived low ability	0.106 (1.585)	0.129 (1.617)	0.080 (0.728)	0.607ns	*Not supported* (No difference)
H3a,b. Technological facilitation barriers → Perceived lack of effort	0.297 (3.993)	0.303 (3.007)	0.298 (2.798)	0.356ns	*Not supported* (No difference)
H4a,b. Technological facilitation barriers → Perceived low ability	0.522 (8.034)	0.476 (5.604)	0.590 (5.392)	–8.336***	*Supported* (Stronger effect for the small group)
H5a,b. Perceived lack of effort → Perceived low ability	0.337 (4.648)	0.383 (4.538)	0.264 (2.270)	8.573***	*Supported* (Stronger effect for the large group)
H6b. Perceived lack of effort → Knowledge sharing behavior	–0.177 (2.061)	–0.221 (1.973)	–0.109 (0.767)	–6.500***	*Supported* (Negative stronger effect for the large group)
H7a,b. Perceived low ability → Knowledge sharing behavior	–0.301 (3.793)	–0.281 (2.682)	–0.329 (2.474)	8.573***	*Not supported* (Negative stronger effect for the small group)

Notes: *ns*: non-significant; ***p-value < 0.01; The multi-group analysis equation suggested by Chin *et al.* (2003) and Keil *et al.* (2000) is as follows: $t_{ij} = \frac{P_1 - P_2}{\sqrt{\frac{(n_1-1)\times SE_1^2 + (n_2-1)\times SE_2^2}{n_1+n_2-2}} \times \sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$; where P_i: Path coefficient in structural model; n_j: Sample size of data set; SE_i: Standard error of path in structural model; t_{ij}: t statistic with $n_1 + n_2 - 2$ levels of freedom; and i: 1 = Large firm group and j: 2 = Small firm group.

(β = 0.522, $p < 0.01$). *H3a* and *H4a* were thus supported. Moreover, our results showed that perceived low lack of effort (β = 0.337, $p < 0.01$) had a strong effect on perceived low ability, and so *H5a* was supported. In addition, perceived lack of effort (β = −0.177, $p < 0.05$) had a negative effect on knowledge sharing behavior, and therefore, *H6a* was supported. Finally, perceived low ability (β = −0.301, $p < 0.01$) had a significant and negative relationship with knowledge sharing behavior, indicating support for *H7a*.

To test the hypotheses involving differences between large and small firms, we statistically compared the corresponding path coefficients from the structural models of these two groups, as suggested by an earlier study (Keil *et al.*, 2000). A significant *t*-value indicated that the coefficient of the same path obtained from the two groups differed significantly. The *t*-test results (Table IV) indicated that the large firm group yielded a significantly weaker relationship between organizational barriers and perceived lack of effort than that the small firm group (t = −4.473, $p < 0.01$), and thus *H1b* was not supported. However, the results revealed no difference in the effect of organizational barriers on perceived low ability (t = 0.607) for both large and small firm groups, so *H2b* was not supported. Although technological barriers had strong effects on perceived lack of effort (t = 0.356), the results indicated no difference between the two groups, and so *H3b* was not supported. Furthermore, the results showed that the path coefficient from technological barriers to perceived low ability for the small firm group was significantly stronger than for the large firm group (t = −8.336, $p < 0.01$), and thus *H4b* was supported.

With regard to the internal attributions, the effect of perceived lack of effort had a stronger influence on perceived low ability for the large firm group than for the small group (t = 8.573, $p < 0.01$), thus supporting *H5b*. Furthermore, the relationship between perceived lack of effort and knowledge sharing was significantly stronger for the large firm group than the small firm group (t = −6.500, $p < 0.01$), supporting *H6b*. However, the effect of perceived low ability on knowledge sharing behavior was stronger for the small firm group than the large firm group (t = 8.573, $p < 0.01$), and so *H7b* was not supported.

6. Discussion and conclusion

By considering both organizational and technological barriers in its theoretical model, this study has accounted for a substantial portion of the variance in knowledge sharing behavior. Moreover, it illustrates how firm size may moderate the relationship between causal factors (organizational and technological barriers) and internal attributions (perceived low ability and lack of effort). Tables IV summarize the results of this study.

Following social exchange theory, organizational support is positively related on effort of individual in sharing their valuable knowledge (King and Marks, 2008). The results suggest that organizational supports provide encouragement of employees' effort in knowledge sharing behavior. This reflects the belief that organizational support will increase the intrinsic motivations that impact an individual's effort. The results of this study support this view by showing the relationship between organizational barriers and perceived lack of effort. As such, a higher level of organizational barriers tends to increase the perceived lack of effort. However, when the firm size variable was entered into the model to test its moderating effects, the relationship between organizational barriers and perceived lack of effort was higher for the small firm group than for the large firm group, inconsistent with the hypothesis. A partial explanation for this might be the use of employee reward schemes that base pay on firm performance. When small firms have weak organizational support, resource constraints and a lack of reward schemes, they may not encourage employees to make greater efforts to share knowledge when compared with large firms (Ruzzier and Ruzzier, 2015). Additionally, large firms have more financial and human resources with which the same task can be done by cooperation among various individuals. As such, employees will not attribute any outcomes to their lack of effort in the face of organizational barriers. In contrast, small firms have fewer resources and the tasks that must be carried out

by each individual employee are greater, so when faced with the impact of organizational barriers such staff will attributed any outcome to their own characteristics. Moreover, the division of power and responsibilities among employees in a large firm is clearer than that of a small firm, so employees in the latter tend to attribute the barriers of the organization to their own lack of effort. For this reason, small firms have a stronger relationship between organizational barriers and perceived lack of effort than large firms.

Unexpectedly, the results showed that there were no significant effects of organizational barriers on perceived low ability. The findings also indicated that there was no difference in the effects of organizational barriers on perceived low ability between large and small firms. Although there was no significant relationship between organizational barriers and perceived low ability, organizational barriers have an indirect effect on perceived low ability through perceived lack of effort. The results of this study showed that perceived lack of effort is a significant predictor of perceived low ability. A likely explanation for these results is that attributions can exert powerful effects on motivation, and, as Schunk (1983) pointed out, effort is more important in the early stages of learning, while ability, skill or strategy use are more important later on.

The results also showed that technological barriers had a strong influence on perceived lack of effort and perceived low ability. This indicates the importance of technology in providing the motivation for employees to engage in knowledge sharing. Previous research suggested that employees'use of information technology applications is an important factor in their knowledge sharing efficacy (Kim and Lee, 2006). According to Riege (2005), inappropriate use of technology can result in a reluctance to use it. As shown in the literature, technological barriers were found to be the critical determinant of effort and ability. Furthermore, the results of testing the differences between large and small firms showed that there was no difference in the effects of technological barriers on perceived lack of effort between the two groups. However, the findings also showed that the small firm group saw a stronger effect of technological barriers on perceived low ability than the large firm group. A previous study proposed that small firms rely more on external knowledge and technologies, and focus more on the process of creative adoption and incremental imitation of process innovation (Antonelli and Scellato, 2015). Moreover, as Bontis *et al.* (2007) pointed out, large firms tend to have more technical resources and skills, whereas small firms suffer from resource poverty, with tight IT budgets, a lack of IT personnel and expertise and short-range management perspectives, resulting in more barriers to firm capabilities and technology adoption. Therefore, the results of this study indicated that the inadequate technological environments in small firms may lead to more negative experiences, and so increase the perceived low ability to share knowledge in such companies.

Furthermore, the results of this study were consistent with our hypotheses. Depending on beliefs about the relationship between effort and ability, employees' perceived lack of effort increases their perceived low ability, at both large and small firms. This indicates that a lack of effort is a predictor of low ability. The explanation for this finding is that effort will enhance the ability to share knowledge. We argue that a dynamic perspective that considers changes in ability can facilitate the positive relationship between effort and ability. Lam *et al.* (2008) suggested that Asian people tend to see a positive relationship between ability and effort. Similarly, Taiwanese employees believe that people who work hard will have a greater ability, and those who have more ability must have worked hard. Therefore, we argue that when employees have low perceived effort then this may lead to low ability in knowledge sharing in this context.

With regard to the effects of internal attributions on knowledge sharing, both effort and ability play important roles in such behavior in large firms. Specifically, in large firms, the high organizational and technological barriers tend to increase the levels of perceived lack of effort and low ability, causing them to have more negative effects on knowledge sharing.

Based on Siemsen *et al.* (2008), a lack of organizational and management support creates barriers to motivation and ability. Consistent with attribution theory (Weiner, 1985), the perceived success and failure of one's efforts are seen as owing to internal causes, such as a lack of ability and effort, or lower self-esteem and self-worth. As such, individuals who perceived they had low ability or a lack of effort would be less likely to share knowledge. Finally, an interesting finding of this study is that there were different effects of organizational and technological barriers on knowledge sharing behavior for small firms. With regard to organizational barriers, when these are greater they cause a higher level of perceived lack of effort that then negatively impacts knowledge sharing behavior through perceived low ability. Although effort did not have a direct effect, the impact of effort on knowledge sharing behavior was mediated by ability. On the other hand, when technological barriers are greater, this causes employees with perceived low ability to engage in less knowledge sharing. Overall, the results of this study indicated that the employees perceived that lack of effort and lack of ability will negatively affect the performance of knowledge sharing. Therefore, enhancing employees' self-efficacy will promote the implementation of such behavior.

7. Implications

This study applies causal impediments to explore how internal attributions discourage knowledge sharing behavior. We identify and examine two major causal impediments, which are organizational and technological barriers, and examine how these impact firms of different sizes with regard to how employees share knowledge. A review of self-efficacy theory indicates that an individual's beliefs in their abilities can predict their behavior and attitudes, and that negative beliefs may discourage knowledge sharing behavior in both large and small firms (Kuo and Young, 2008). Furthermore, when a firm grows and there are then multiple groups within the organization, then the efforts made to share knowledge among employees seem to decrease.

By using both organizational and technological barriers to explore internal attributions, our research offers three contributions to the literature. First, the current study extends previous work by demonstrating that internal attributions and individual beliefs, such as perceived lack of effort and perceived low ability, may act as hindrances to knowledge sharing behavior. In accordance with attribution theory, the results indicate that the behavioral consequence of knowledge sharing results directly from the cognitive psychological consequence of internal attribution. The findings suggest that perceived low ability is a critical attribute that impedes knowledge sharing behavior, and the perception of a lack of effort is related to the underlying the perception of low ability. This implies that it is important for organizations to help shape and facilitate employees' perceptions of knowledge sharing by increasing their self-efficacy through providing more organizational supports, as also argued by Wang and Noe (2010).

Second, this study finds that technological barriers are the more significant obstacle to better individual beliefs for both small and large firms than organizational barriers. According to the results obtained in this work, technological barriers have direct effects on employees' beliefs with regard to perceived low ability, and have indirect effects through perceived lack of effort. They can cause technophobia, meaning that employees naturally resist the need to use new methods and technologies for sharing knowledge because of their unfamiliarity with these systems (Lin *et al.*, 2012).Therefore, the establishment of information systems and communication mechanisms is the basis for the implementation of effective knowledge management. Building an easy-to-use and efficient information system will help enhance employees' self-efficacy and drive their knowledge sharing behaviors.

Finally, firm size was found to be related to internal attributions and individual beliefs with regard to knowledge sharing behavior. It appears that smaller firms are more sensitive to

such barriers and to individual beliefs as compared to larger firms. This difference could arise from the greater organizational support and technological advances that larger firms tend to have. In other words, large firms are better able to command the systematic generation and exploitation of codified technological change and pay more attention to building the human and social capital needed to foster employees' effort and ability to engage in knowledge sharing behavior as compared to small firms.

8. Limitations and future research

Although it has new findings, this study has the following limitations that need to be addressed by future research. First, although this study concentrates on exploring the effects of organizational and technological barriers on employees' knowledge sharing behavior at firms of different sizes, it did not address the different situations of employees who work at large firms but distributed into several small units in different locations, and those who work at large firms and have centralized management in same location. In addition, younger employees may use technology to share knowledge more than older employees. The impacts of different employee ages and the average ages at large/small firms on the research model were not discussed in this study. As such, researchers may consider differences in firm size and division location in the sampling process, as well as the ages of employees at large/small firms. Such efforts would help in making a more comprehensive assessments of the issues examined this work.

References

Abernathy, W.J. and Utterback, J.M. (1978), "Patterns of industrial innovation", *Technology Review*, Vol. 80 No. 7, pp. 40-47.

Acs, Z.J. and Audretsch, D.B. (1988), "Innovation in large and small firms: an empirical analysis", *The American Economic Review*, Vol. 78 No. 4, pp. 678-690.

Ajmal, M., Helo, P. and Kekäle, T. (2010), "Critical factors for knowledge management in project business", *Journal of Knowledge Management*, Vol. 14 No. 1, pp. 156-168.

Alavi, M. and Leidner, D.E. (2001), "Review: knowledge management and knowledge management systems: conceptual foundations and research issues", *MIS Quarterly*, Vol. 25 No. 1, pp. 107-136.

Antonelli, C. and Scellato, G. (2015), "Firms size and directed technological change", *Small Business Economics*, Vol. 44 No. 1, pp. 207-218.

Bandura, A. (1982), "Self-efficacy mechanism in human agency", *American Psychologist*, Vol. 37 No. 2, pp. 122-147.

Bandura, A. (1993), "Perceived self-efficacy in cognitive development and functioning", *Educational Psychologist*, Vol. 28 No. 2, pp. 117-148.

Bandura, A. (1997), *Self-Efficacy: The Exercise of Self-Control*, Freeman, New York, NY.

Baumann-Pauly, D., Wickert, C., Spence, L.J. and Scherer, A.G. (2013), "Organizing corporate social responsibility in small and large firms: size matters", *Journal of Business Ethics*, Vol. 115 No. 4, pp. 693-705.

Benbya, H. (2008), *Knowledge Management Systems Implementation: Lessons from the Silicon Valley*, Chandos Publishing. Oxford.

Bond, M.H., Leung, K. and Wan, K.C. (1982), "The social impact of self-effacing attributions: the Chinese case", *The Journal of Social Psychology*, Vol. 118 No. 2, pp. 157-166.

Bontis, N., Bart, C., Sáenz, J., Aramburu, N. and Rivera, O. (2009), "Knowledge sharing and innovation performance: a comparison between high-tech and low-tech companies", *Journal of Intellectual Capital*, Vol. 10 No. 1, pp. 22-36.

Bontis, N., Bart, C.K., Serenko, A., Bontis, N. and Hardie, T. (2007), "Organizational size and knowledge flow: a proposed theoretical link", *Journal of Intellectual Capital*, Vol. 8 No. 4, pp. 610-627.

Chang, H.H. and Chuang, S.S. (2011), "Social Capital and individual motivations on knowledge sharing: participant involvement as a moderator", *Information & Management*, Vol. 48 No. 1, pp. 9-18.

Chiaburu, D.S. and Marinova, S.V. (2005), "What predicts skill transfer? An exploratory study of goal orientation, training self-efficacy and organizational supports", *International Journal of Training and Development*, Vol. 9 No. 2, pp. 110-123.

Chien, Y., Tsai, Y.F. and Cheh, C.Y. (2013), "Knowledge sharing, organizational climate, and innovative behavior: a cross-level analysis of effects", *Social Behavior and Personality*, Vol. 41 No. 1, pp. 143-156.

Chin, W.W., Marcolin, B.L. and Newsted, P.R. (2003), "A partial least squares latent variable modeling approach for measuring interaction effects: results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study", *Information Systems Research*, Vol. 14 No. 2, pp. 189-217.

Connelly, C.E. and Kelloway, K.E. (2003), "Predictors of employees' perceptions of knowledge sharing cultures", *Leadership & Organization Development Journal*, Vol. 24 No. 5, pp. 294-301.

Cummings, J.L. and Teng, B.-S. (2006), "The keys to successful knowledge-sharing", *Journal of General Management*, Vol. 31 No. 4, pp. 1-18.

Connelly, C.E., Ford, D.P., Turel, O., Gallupe, B. and Zweig, D. (2014), "I'm busy (and competitive)!'Antecedents of knowledge sharing under pressure", *Knowledge Management Research & Practice*, Vol. 12 No. 1, pp. 74-85.

Denison, D.R. (1996), "What is the difference between organizational culture and organizational climate? A native's point of view on a decade of paradigm wars", *Academy of Management Review*, Vol. 21 No. 3, pp. 619-654.

Forés, B. and Camisón, C. (2016), "Does incremental and radical innovation performance depend on different types of knowledge accumulation capabilities and organizational size?", *Journal of Business Research*, Vol. 69 No. 2, pp. 831-848.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Gavirneni, S., Kapuscinski, R. and Tayur, S. (1999), "Value of information in capacitated supply chains", *Management Science*, Vol. 45 No. 1, pp. 16-24.

Hair, J.F., Anderson, R.E., Tatham, R.L. and William, B. (1998), *Multivariate Data Analysis*, Prentice Hall, Upper Saddle River, NJ.

Han, R. (1996), "On the attribution of success or failure of primary and Middle school students in examinations", *Acta Psychologica Sinica*, Vol. 28 No. 2, pp. 140-147.

Heider, F. (1958), *The Psychology of Interpersonal Relations*, Wiley. New York, NY.

Huysman, M. and Wulf, V. (2006), "IT to support knowledge sharing in communities, towards a social Capital analysis", *Journal of Information Technology*, Vol. 21 No. 1, pp. 40-51.

Igbaria, M., Parasuraman, S. and Baroudi, J.J. (1996), "A motivational model of microcomputer usage", *Journal of Management Information S*, Vol. 13 No. 1, pp. 127-143.

Jolaee, A., Md Nor, K., Khani, N. and Md Yusoff, R. (2014), "Factors affecting knowledge sharing intention among academic staff", *International Journal of Educational Management*, Vol. 28 No. 4, pp. 413-431.

Kanfer, R. and Ackerman, P.L. (1989), "Motivation and cognitive abilities: an integrative/aptitude-treatment interaction approach to skill acquisition", *Journal of Applied Psychology*, Vol. 74 No. 4, p. 657.

Keil, M., Tan, B.C., Wei, K.K., Saarinen, T., Tuunainen, V. and Wassenaar, A. (2000), "A cross-cultural study on escalation of commitment behavior in software projects", *MIS Quarterly*, Vol. 24 No. 2, pp. 299-325.

Kim, S. and Lee, H. (2006), "The impact of organizational context and information technology on employee knowledge-sharing capabilities", *Public Administration Review*, Vol. 66 No. 3, pp. 370-385.

King, W.R. and Marks, P.V. (2008), "Motivating knowledge sharing through a knowledge management system", *Omega*, Vol. 36 No. 1, pp. 131-146.

Koh, J.H.L., Chai, C.S. and Tay, L.Y. (2014), "TPACK-in-action: unpacking the contextual influences of teachers' construction of technological pedagogical content knowledge (TPACK)", *Computers & Education*, Vol. 78 pp. 20-29.

Kukko, M. and Helander, N. (2012), "Knowledge sharing barriers in growing software companies", paper presented at the 45th Hawaii International Conference on System Sciences (HICSS), Hawaii.

Kuo, F.Y. and Young, M.L. (2008), "Predicting knowledge sharing practices through intention: a test of competing models", *Computers in Human Behavior*, Vol. 24 No. 6, pp. 2697-2722.

Lam, S.F., Yim, P.S. and Ng, Y.I. (2008), "Is effort praise motivational? The role of beliefs in the effort–ability relationship", *Contemporary Educational Psychology*, Vol. 33 No. 4, pp. 694-710.

Lee, G. and Xia, W. (2006), "Organizational size and IT innovation adoption: a Meta-analysis", *Information & Management*, Vol. 43 No. 8, pp. 975-985.

Leiblein, M.J. and Madsen, T.L. (2009), "Unbundling competitive heterogeneity: incentive structures and capability influences on technological innovation", *Strategic Management Journal*, Vol. 30 No. 7, pp. 711-735.

Lin, C., Wu, J.C. and Yen, D.C. (2012), "Exploring barriers to knowledge flow at different knowledge management maturity stages", *Information & Management*, Vol. 49 No. 1, pp. 10-23.

Lin, H.F. and Lee, G.-G. (2004), "Perceptions of senior managers toward knowledge-sharing behaviour", *Management Decision*, Vol. 42 No. 1, pp. 108-125.

Martinko, M.J., Zmud, R.W. and Henry, J.W. (1996), "An attributional explanation of individual resistance to the introduction of information technologies in the workplace", *Behaviour & Information Technology*, Vol. 15 No. 5, pp. 313-330.

McDonald, T. and Siegall, M. (1992), "The effects of technological self-efficacy and job focus on job performance, attitudes, and withdrawal behaviors", *The Journal of Psychology*, Vol. 126 No. 5, pp. 465-475.

McLaughlin, S., Paton, R.A. and Macbeth, D.K. (2008), "Barrier impact on organizational learning within complex organizations", *Journal of Knowledge Management*, Vol. 12 No. 2, pp. 107-123.

Michailova, S. and Husted, K. (2003), "Knowledge sharing in Russian companies with western participation", *Management International*, Vol. 6 No. 2, pp. 19-28.

Michailova, S. and Minbaeva, D.B. (2012), "Organizational values and knowledge sharing in multinational corporations: the Danisco case", *International Business Review*, Vol. 21 No. 1, pp. 59-70.

Natale, K., Aunola, K. and Nurmi, J.E. (2009), "Children's school performance and their parents' causal attributions to ability and effort: a longitudinal study", *Journal of Applied Developmental Psychology*, Vol. 30 No. 1, pp. 14-22.

Porter, M.E. and Kramer, M.R. (2002), "The competitive advantage of corporate philanthropy", *Harvard Business Review*, Vol. 80 No. 12, pp. 56-68.

Ranjbarfard, M., Aghdasi, M., López-Sáez, P. and Emilio Navas López, J. (2014), "The barriers of knowledge generation, storage, distribution and application that impede learning in gas and petroleum companies", *Journal of Knowledge Management*, Vol. 18 No. 3, pp. 494-522.

Reinholt, M., Pedersen, T. and Foss, N.J. (2011), "Why a Central network position isn't enough: the role of motivation and ability for knowledge sharing in employee networks", *Academy of Management Journal*, Vol. 54 No. 6, pp. 1277-1297.

Riege, A. (2005), "Three-dozen knowledge-sharing barriers managers must consider", *Journal of Knowledge Management*, Vol. 9 No. 3, pp. 18-35.

Rosen, B., Furst, S. and Blackburn, R. (2007), "Overcoming barriers to knowledge sharing in virtual teams", *Organizational Dynamics*, Vol. 36 No. 3, pp. 259-273.

Ruzzier, M. and Ruzzier, M.K. (2015), "On the relationship between firm size, resources, age at entry and internationalization: the case of Slovenian SMEs", *Journal of Business Economics and Management*, Vol. 16 No. 1, pp. 52-73.

Ryu, S., Ho, S.H. and Han, I. (2003), "Knowledge sharing behavior of physicians in hospitals", *Expert Systems with Applications*, Vol. 25 No. 1, pp. 113-122.

Schermerhorn, J.R., Gardner, W.L. and Martin, T.N. (1990), "Management dialogues: turning on the marginal performer", *Organizational Dynamics*, Vol. 18 No. 4, pp. 47-59.

Schunk, D.H. (1983), "Ability versus effort attributional feedback: differential effects on self-efficacy and achievement", *Journal of Educational Psychology*, Vol. 75 No. 6, p. 848.

Siemsen, E., Roth, A.V. and Balasubramanian, S. (2008), "How motivation, opportunity, and ability drive knowledge sharing: the constraining-factor model", *Journal of Operations Management*, Vol. 26 No. 3, pp. 426-445.

Stajkovic, A.D. and Luthans, F. (2001), "Differential effects of incentive motivators on work performance", *Academy of Management Journal*, Vol. 44 No. 3, pp. 580-590.

Szulanski, G. (2002), *Sticky Knowledge: Barriers to knowing in the Firm*, Sage Publications. London.

Usoro, A., Sharratt, M.W., Tsui, E. and Shekhar, S. (2007), "Trust as an antecedent to knowledge sharing in virtual communities of practice", *Knowledge Management Research & Practice*, Vol. 5 No. 3, pp. 199-212.

Verdú-Jover, A.J., Lloréns-Montes, F.J. and García-Morales, V.J. (2006), "Environment–flexibility coalignment and performance: an analysis in large versus small firms", *Journal of Small Business Management*, Vol. 44 No. 3, pp. 334-349.

Wang, S. and Noe, R.A. (2010), "Knowledge sharing: a review and directions for future research", *Human Resource Management Review*, Vol. 20 No. 2, pp. 115-131.

Weiner, B. (1972), "Attribution theory, achievement motivation, and the educational process", *Review of Educational Research*, Vol. 42 No. 2, pp. 203-215.

Weiner, B. (1985), "An attributional theory of achievement motivation and emotion", *Psychological Review*, Vol. 92 No. 4, pp. 548-573.

Weiner, B. (2006), *Social Motivation, Justice, and the Moral Emotions: An Attributional Approach*, Erlbaum. Mahwah, NJ.

Williams, J.M. (2013), *Cognitive Approaches to Neuropsychology*, Springer Science & Business Media. New York, NY.

Wu, L. and Chiu, M.L. (2015), "Organizational applications of IT innovation and firm's competitive performance: a resource-based view and the innovation diffusion approach", *Journal of Engineering and Technology Management*, Vol. 35 No. 1, pp. 25-44.

Yang, C. and Chen, L.C. (2007), "Can organizational knowledge capabilities affect knowledge sharing behavior?", *Journal of Information Science*, Vol. 33 No. 1, pp. 95-109.

Yang, S.C. and Farn, C.K. (2009), "Social capital, behavioural control, and tacit knowledge sharing – a multi-informant design", *International Journal of Information Management*, Vol. 29 No. 3, pp. 210-218.

Yao, C.Y., Tsai, C.C. and Fang, Y.C. (2015), "Understanding social Capital, team learning, members' e-loyalty and knowledge sharing in virtual communities", *Total Quality Management & Business Excellence*, Vol. 26 Nos 5/6, pp. 619-631.

Zenger, T.R. (1994), "Explaining organizational diseconomies of scale in R&D: agency problems and the allocation of engineering talent, ideas, and effort by firm size", *Management Science*, Vol. 40 No. 6, pp. 708-729.

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