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Governing Individual Knowledge Sharing Behavior

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GOVERNING INDIVIDUAL KNOWLEDGE SHARING BEHAVIOR

Abstract

The emerging Knowledge Governance Approach asserts the need to build micro-foundations grounded in individual action. Toward this goal, using the Theory of Planned Behavior, we aim to explain individual knowledge sharing behavior as being determined by the intention to share knowledge and its antecedents: attitude toward knowledge sharing, subjective norms, and perceived behavioral control. In addition, we consider managerial interventions (governance mechanisms) that managers can employ to influence the identified antecedents and thereby govern individual knowledge sharing behavior. We test the model arrived at on a dataset collected among individuals engaged in knowledge sharing in two competing firms. Results of the LISREL analysis show that the use of rewards affects attitudes toward knowledge sharing negatively, while the use of reciprocal schemes and communication mechanisms have a positive effect on subjective norms and perceived behavioral control, respectively.

Keywords: knowledge governance, knowledge sharing, theory of planned behavior

INTRODUCTION

The importance of the governance of knowledge processes has been consistently emphasized in the literature (e.g., Grandori and Kogut, 2002; Foss, 2007) as without such governance this invaluable resource may remain undiscovered, underleveraged, and trapped in individual minds. Hence, governance mechanisms that may enhance knowledge processes have increasingly become the focus of investigations by knowledge-based scholars (e.g., Minbaeva et al., 2003; Janssen et al., 2006; Kang et al., 2007). However, despite an increasing interest in the subject, it is surprising how little empirical research provides an understanding (beyond correlation) of the relationship between governance mechanisms and knowledge processes.

Toward this goal, one significant theoretical development is the emerging Knowledge Governance Approach (KGA) (Grandori, 2001; Foss, 2007). It focuses on the interplay between knowledge-based contingency factors and organizational routines such as reward systems, coordination mechanisms, and standard operating procedures. To identify the mechanisms, KGA asserts the need to *build micro-foundations grounded in individual action and interaction* for organizational knowledge-based phenomena (Felin and Foss, 2005). As Foss (2007) explains, governance mechanisms are deployed in the belief that influencing the conditions of individual actions in a certain manner will lead employees to take those decisions that, when aggregated, lead to favorable organizational outcomes.

The current theoretical challenge lies in unfolding the general concept of micro-foundation by identifying those *conditions of individual actions* that influence behavior (Foss, 2007). Yet, just highlighting the conditions of individual action is of little help to

managers. Hence, we need to consider managerial interventions (governance mechanisms) which managers can employ to influence the conditions of individual actions and thereby facilitate individual knowledge sharing behavior.

In this study, we integrate the Theory of Planned Behavior (TPB) with the KGA as one potential avenue for creating a greater understanding of the micro-foundation of the knowledge process in firms. The TPB is a general theory developed in psychology that identifies the antecedents of human behavior such as why a person buys a new computer, votes against a certain candidate, performs miserably during an exam, etc. The TPB is an individual-level theory, and has received a great deal of attention in social cognition models as it identifies the antecedents of attitude, subjective norms, and perceived behavioral control - corresponding beliefs reflecting the underlying cognitive structure, and it specifies the role of behavioral interventions (Ajzen, 1991; Armitage and Conner, 2001). Extending the work on TPB into the knowledge domain allows us to go a step further and consider how the antecedents of individual behavior may be influenced by managerial interventions (governance mechanisms).

In sum, we intend to make two contributions as we (1) endogenously explain the knowledge sharing behavior of individuals as determined by the intention to share knowledge and its antecedents: attitudes toward knowledge sharing, subjective norms, and perceived control; and (2) suggest governance mechanisms (like rewards, reciprocal schemes, and communication mechanisms) that influence the identified antecedents. Further, in response to the recent calls for focus on the role that individuals play in leveraging knowledge (Felin and Hesterly, 2007), we use data collected at the individual (micro) level. Regrettably, previous studies have mainly focused on a more aggregate

level (i.e. organizational units) and often limited validity of the data by the use of only one or few respondents per organization – usually a CEO and/or general managers.

The remainder of the paper is structured in the following way. Building upon the insights of the TPB, we first suggest how behavioral antecedents affect individuals' knowledge sharing behavior. Subsequently, we seek to identify knowledge governance mechanisms that influence the antecedents identified. The empirical testing of the proposed model is based on data collected among individuals engaged in knowledge sharing in two Danish firms, Danisco and Chr.Hansen, which compete head to head in the global market for food ingredients, where they are both dominant players. Finally, we discuss our findings and their implications in terms of both theory and practice.

KNOWLEDGE SHARING: THE ROLE OF INDIVIDUALS

The knowledge-based view (KBV) considers a firm to be “a knowledge-integrating institution” (Grant, 1996: 111) and “a social community specializing in the speed and transfer of knowledge” (Kogut and Zander, 1996: 503). It puts emphasis on social interactions as efficient means for intra-organizational knowledge exchange. Such a view is in line with research on intra-organizational knowledge sharing, which considers knowledge sharing to be a relational concept that depends on an individual's willingness to share knowledge. The challenge for organizations is thus to promote individual knowledge sharing behavior through the effective use of organizational mechanisms and to provide organizational members with the opportunity to interact with colleagues within and across departments, functions and business units (Pan and Scarbrough, 1998).

However, the KBV was criticized for using only variables defined at the organizational level (such as culture, community, routine, and environment) as *explanans* for outcomes or as the antecedents to new value (Felin and Hesterly, 2007). It was argued that since individuals are “the primary actors in knowledge creation and the principle repository of knowledge” (Grant, 1996: 121), knowledge-based scholars should “carefully revisit their underlying philosophical and theoretical assumptions about the primacy given to collectives and to consider potential individual-level explanations as antecedents to new value creation” (Felin and Hesterly, 2007: 214). Hence to push further the empirical research on knowledge sharing, we need to integrate some *individual-level theories – those considering individuals and their actions as the basic units of analysis* (Elster, 1989).

To date, many studies on knowledge sharing which do consider individual-level theories have utilized the insights from motivational theories. In particular, Minbaeva et al. (2003) utilized the insights from the Vroom’s Expectancy Theory to argue that both individual ability and motivation to absorb knowledge are needed to achieve a higher degree of knowledge transfer. Deci’s Intrinsic Motivation Theory arguments were used by several scholars who argue that especially intrinsic motivation has a positive effect on knowledge sharing (Cabrera, Collins and Salgado, 2006; Osterloh and Frey, 2000). Notwithstanding the contribution made by these studies, their results – especially those with managerial implications - are difficult to integrate. This may be explained by the fact that the above-mentioned theories pertain to “different elements of the motivation sequence and therefore are designed to explain different things” (Locke, 1991: 295). To advance our understanding of what drives individual behavior and how it can be governed Locke

(1991) suggests that future studies need to move further along the “Motivation Sequence” (see Figure 1). In the figure, Locke (1991) identifies “key motivational concepts in chronological sequence” (from “Needs” to “Satisfaction”) and shows “where in the sequence each major theory of motivation is focused” (p. 288). He argues that organizational intervention via governance mechanisms at the “Need” stage is impossible because needs are innate. Intervening at the later stage of “Value” is difficult in that “it would require either some form of therapy or very intense, structured experiences which would be of questionable ethical status” (Locke, 1991: 296). Instead, Locke advises considering theories constituting the “Motivational Hub”, “*where the action is*” (Locke, 1991: 296; original italics). One of the theories outlined by Locke as the Motivational Hub theory is the Ajzen’s Theory of Planned Behavior. In the next section, we describe the theory and, drawing on it, put forward hypotheses on how knowledge sharing behavior of individuals could be governed via organizational mechanisms.

-INSERT FIGURE 1 ABOUT HERE -

KNOWLEDGE SHARING BEHAVIOR OF INDIVIDUALS: THE APPLICATION OF THE THEORY OF PLANNED BEHAVIOR

The TPB is an extension of the theory of reasoned action (TRA) introduced by Fishbein and Ajzen (1975). According to the TRA, the proximal determinant of whether or not a person behaves in a certain way is her intentions to do so, which in turn are determined by two constructs: attitude and subjective norm. Although meta-analytic reviews supported the predictive validity of the TRA (e.g. Sheppard et al., 1988), it was concluded that the TRA only predicts voluntary behaviors or behaviors over which the

individual has a good deal of control (Sheeran et al., 2003: 394). To address this issue, Ajzen (1985, 1991) extended the TRA by including another construct: perceived behavioral control, and specifying behavioral interventions designed to change the behavior in question. The rationale behind adding the perceived behavioral control was that “it would allow prediction of behaviors that were not under complete volitional control”. It could provide “information about the potential constraints on action as perceived by the actor” and it might help to “explain why intentions do not always predict behavior” (Armitage and Conner, 2001: 472). The extended version was referred to as the “Theory of Planned Behavior”.

The TPB posits that (behavioral) intentions are the main determinants of behavior. The strength of an intention is indicated by the person’s subjective probability that she will perform the behavior in question. The TPB defines intentions as being determined by attitude toward the behavior, subjective norm, and perceived behavioral control. Attitude is defined as “a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object” (Fishbein and Ajzen 1975: 6). It is recommended to use the term “attitude toward a behavior” since it reflects a person’s evaluation that performing the behavior is good or bad, that she is in favor of or against performing the behavior. The subjective norm reflects the person’s perception that others desire “the performance or non-performance of a specific behavior” (Ajzen and Fishbein, 1980: 57), i.e. they are in favor of or opposition to her performance of the behavior. Sometimes these two components of intention may be in disagreement. A person may hold a favorable attitude toward a certain behavior, but will not engage in the behavior since important others believe that s/he should not perform it. Perceived behavioral

control is defined as the person's perceptions of her ability to perform a given behavior and likelihood of being successful at doing so (Ajzen, 1991). Intention to behave will also depend upon the level of perceived behavioral control because "a person is unlikely to intend to perform a behavior that is outside her control" (Sheeran et al., 2002: 394). In sum, "the more favorable the attitude and subjective norm with respect to a behavior, and the greater the perceived behavioral control, the stronger should be an individual's intention to perform the behavior under consideration" (Ajzen, 1991: 188)

As argued earlier, the TPB has been a useful tool to predict a wide range of behaviors. Applying the TPB to understand knowledge sharing behavior, we define the behavioral components in the following way. By behavior, we mean the actual knowledge sharing behavior of an individual, which is manifested in the extent to which the individual in question receives and utilizes knowledge from colleagues. According to the TPB, intentions are assumed to capture the motivational factors that influence behavior: "they are indications of how hard people are willing to try or how much of an effort they are planning to exert, in order to perform the behavior" (Ajzen, 1991: 181). In our case, the likelihood that an individual will engage in knowledge sharing may be termed as her intention to share knowledge. The TPB argues that under well-controlled conditions, intentions can predict overt behavior (discussion and empirical evidence in Ajzen and Fishbein, 1970; Ajzen 1971; Ajzen and Fishbein, 1973). Recent literature on knowledge sharing also argues that behavioral intentions could be considered as pre-requisites for the knowledge sharing behavior of individuals (Lin and Lee, 2004; Bock et al., 2005). Indeed, since much human behavior in general and knowledge sharing behavior in

particular are under volitional control, the best predictor of an individual's behavior will be her intention to perform that behavior. Thus,

Hypothesis 1. Strong intention to engage in knowledge sharing behavior positively influences the extent of knowledge sharing behavior.

According to the TPB, there are three conceptually independent determinants of intention: attitude toward the behavior, subjective norm, and perceived behavioral control. The attitude toward knowledge sharing refers to the individual's judgment that conducting the knowledge sharing is good or bad; that she is in favor of or against knowledge sharing (Bock et al., 2005). In other words, a person holding a favorable attitude toward knowledge sharing would be expected to have a higher behavioral intention to share knowledge (Lin and Lee, 2004). Bock et al's (2005) similar proposition received full support in their empirical testing. Accordingly we expect,

Hypothesis 2. A positive attitude toward knowledge sharing positively influences the individual's intention to share knowledge.

Subjective norm is defined as "a specific behavioral prescription attributed to a generalized social agent" (Ajzen and Fishbein, 1980: 57). Norms are typically defined as patterns of behavior that become accepted as ways that people ought to behave. They are prescriptive but lack the formal status of rules. Subjective norms, however, refer to the person's perception of others' thinking regarding the behavior in question. In forming a subjective norm about knowledge sharing, a person takes into account the normative expectations of various others in her working environment. In other words, she considers whether specific groups or the whole organization agree that knowledge sharing behavior is desired and valued (Lin and Lee, 2004). Bock et al. (2005) found full support for their

hypothesis stipulating that the greater the subjective norm to share knowledge is, the greater the intention to share knowledge will be. Thus,

Hypothesis 3. Strong subjective norms about knowledge sharing positively influence the individual's intention to share knowledge.

The third antecedent of intention is the degree of perceived behavioral control. “In general, individuals are more disposed (i.e. intend) to engage in behaviors that are believed to be achievable” (Armitage and Conner, 2001: 472). ”Translating” the TPB logic for knowledge sharing would imply the following: an individual will most likely engage in knowledge sharing when she holds a positive attitude toward knowledge sharing, when knowledge sharing is a social norm, *and* when that individual perceives knowledge sharing as being more easy than difficult. In the knowledge sharing literature, it has also been pointed out numerous times that an individual's perception of the potential constraints on her action will decrease the extent to which she is willing to engage in knowledge sharing (e.g. Husted and Michailova, 2002).

Thus,

Hypothesis 4. Perceived behavioral control positively influences the individual's intention to share knowledge

The hypotheses are summarized in the theoretical model presented in Figure 2.

-INSERT FIGURE 2 ABOUT HERE -

KNOWLEDGE GOVERNANCE MECHANISMS

Earlier, we argued that attention should be given to governance mechanisms that managers can employ to affect individuals' knowledge sharing behavior. As Foss (2007) explains, governance mechanisms are deployed in the belief that influencing the conditions of individual actions in a certain manner will lead employees to make those decisions that, when aggregated, lead to favorable organizational outcomes. We subscribe to this argument and consequently propose a number of knowledge governance mechanisms that can be applied to influence the previously identified antecedents of behavioral intentions (attitude, subjective norms, and perceived control) and thereby affect the knowledge sharing behavior of individuals.

When discussing behavioral interventions, Ajzen (1991) argues that "it is at the level of beliefs that we can learn about the unique factors that induce one person to engage in the behavior of interest" (pp. 206-207). Hence, managerial interventions (in our case, governance mechanisms) should be designed around the "*salient* beliefs that are considered to be the prevailing determinants of a person's intentions and actions" (p. 189; original italics). Ajzen distinguishes between three beliefs: (1) "*behavioral beliefs*, which are assumed to influence attitudes toward the behavior"; (2) "*normative beliefs*, which constitute the underlying determinants of subjective norms", and (3) "*control beliefs*, which provide the basis for perceptions of behavioral control" (Ajzen, 1991: 189, original italics). In particular,

- behavioral beliefs link the behavior to a certain outcome, or “to some other attribute such as the cost incurred by performing the behavior”(Ajzen, 1991: 191);
- normative beliefs are concerned with the likelihood that important referent individuals or groups approve or disapprove of performing a given behavior;
- control beliefs are about the presence of resources and opportunities that may facilitate or impede the performance of the behavior: “the fewer obstacles or impediments they [individuals] anticipate, the greater should be their perceived control over the behavior” (Ajzen, 1991: 196).

Ajzen further emphasizes that because attitudes, subjective norms, and perceived behavioral control are based on *corresponding* sets of beliefs, behavioral interventions (governance mechanisms) must try to attack the strength of the corresponding beliefs, which ultimately will guide the performance of the behavior (Ajzen, 1991). Consequently, we propose three types of governance mechanisms associated with behavioral, normative, and control beliefs and label them respectively as external rewards, reciprocal schemes, and communication mechanisms.

External rewards

Rewards represent an almost universal form of inducement for individuals to perform. While from an expectancy theory point of view it is the existence of a clear linkage between individual effort and reward that matters, from an equity theory (and organizational justice) perspective, the main question is whether employees perceive that they receive the rewards they are entitled to on the basis of their contribution to the organization. Both perspectives would lead us to expect a positive relationship between

rewards for certain behavior and individual attitudes toward this behavior. In the literature on knowledge sharing, rewards are posited to encourage more positive attitudes toward knowledge sharing (Brock et al., 2005). One of the well-known examples is Siemens ShareNet, which measured and rewarded employees for knowledge sharing. When ShareNet was in its infancy, the reward system was designed to create a critical mass of content by making users aware of the system and encouraging contributions. Therefore we propose,

Hypothesis 5. The more individuals are externally rewarded for knowledge sharing, the more positive their attitude toward knowledge sharing is.

Reciprocal schemes

These governance mechanisms are related to a person's beliefs that "certain referents think the person should or should not perform the behavior in question" (Fishbein and Ajzen 1975: 16). These beliefs associate a behavior with certain outcomes: significant others' approval and disapproval. The stronger the normative belief, the greater the motivation to comply with those referents.

Subjective norms are strengthened when employees get positive feedback on past instances of knowledge sharing, for example, acknowledgement for their contribution to others' work and/or organizational development. The main potential benefits of feedback for the focal individual are: "(a) more accurate signals with regard to goal prioritization; (b) reduced uncertainty with regard to issues surrounding goal attainment; and (c) a better basis for improving his/her own competence" (Barner-Rasmussen, 2003: 42). Brock et al. (2005) found that the anticipated reciprocal relationships are conducive to knowledge sharing. Thus,

Hypothesis 6. The more individuals are reciprocally rewarded for knowledge sharing, the more positive their subjective norm regarding knowledge sharing is.

Communication mechanisms

According to the TPB, control beliefs, which are antecedents of perceived behavior control, are “concerned with the perceived power of specific factors to facilitate or inhibit performance of the behavior” (Armitage and Conner, 2001: 474). Governance mechanisms, which could be employed to affect the control beliefs of the individuals, should increase the perceived presence of “adequate resources and opportunities” that may facilitate the performance of the behavior and increase its “frequency of occurring” (Armitage and Conner, 2001: 474-475).

The importance of the presence and use of communication mechanisms has been emphasized numerous times in the literature on knowledge sharing and transfer. Szulanski (1996) claims that knowledge sharing requires numerous individual exchanges, especially when the knowledge shared has a tacit component. Hansen (1999) concludes that a lack of direct relations and extensive communication between employees from different departments inhibits knowledge flows while strong inter-unit relations facilitate them. Bresman et al. (1999) showed that interpersonal communication, such as visits and meetings, were significant facilitators of international knowledge sharing. Gupta and Govindarajan (2000) considered not only the existence of communication channels but also the richness of communication links, captured as informality, openness, and density of communication. The results provided strong support for the prediction that the existence and richness of lateral interunit integration mechanisms (channels linking a focal subsidiary to the rest of MNC) are positively associated with knowledge sharing.

We would like to emphasize that it is not just the existence of various opportunities to interact, but rather the individuals' *use* of these opportunities that matters for knowledge sharing (Hansen, 2002). Accordingly, we expect that the more an individual makes use of the various opportunities available, the fewer anticipated obstacles and impediments to the performance of the behavior she perceives and hence the stronger her perceived behavioral control is.

Hypothesis 7. The more individuals use communication mechanisms, the stronger their perceived behavioral control is.

METHODS

Data and Sample

All data used in the analysis were from the MANDI (Managing the Dynamic Interfaces between Culture and Knowledge) questionnaire on knowledge sharing among individuals. The questionnaire focuses mainly on the nature of knowledge sharing, governance mechanisms, and individual perceptions of enablers and barriers to knowledge sharing. It was developed as a result of a focused literature review and a cross-case analysis of in-depth case studies conducted in eight firms. Further, the questionnaire was pre-tested with each company participant to increase the clarity of the questions and avoid interpretation errors. The questions were translated and back-translated, thereby reducing the risk of comprehension problems. The questionnaire was available in a number of different languages, in both an electronic (internet-based) and paper-based version.

The questionnaire consisted of 27 questions, most of which applied a fixed-response Likert-type scale. Despite the obvious limitations of perceptual and self-reported measures, they constitute the most suitable methodology for the study of individual human behavior and, when employed through a rigorous research design, may even be superior to other approaches (Howard, 1994; Spector 1994).

We concur with Tsai and Ghoshal (1998) who advocated one-site sampling to ensure that “a number of broad contextual factors that are known to influence the innovative ability of organizations” are controlled for in the research design (p. 468). The aim of the survey was to apply the same questionnaire in a few firms and involve as many employees of the firms as possible. This is a major advantage compared to questionnaires that are designed to target a large number of firms, but only one or a few respondents per organization.

The link to the (internet-based) survey was distributed via the respective firm’s internal e-mail system. Thus, the collection of the questionnaires was mediated by a representative from each of the respective firms, who acted as the contact person. To reduce possible social desirability bias, we followed Tsai and Ghoshal (1998) and explained in the opening paragraph that the survey software prevents any identification of individuals, and data are collected using an external server, and that our analysis would be restricted to an aggregate level.

The survey was applied in two Danish firms: Chr.Hansen and Danisco. Both are leading suppliers of ingredients for food and other consumer products. The knowledge shared in these two firms has the advantage of being codifiable, as it involves a large element of chemistry, which can be codified in formulas etc. This implies that individual drivers of knowledge sharing behavior are particularly important in these firms (rather than the

characteristics of the knowledge), which makes these firms excellent for testing the model of knowledge sharing behavior. Secondary data, which were collected independently of the administered survey, were used to present the case companies (see below) and make the research findings more robust.

Danisco develops and produces food ingredients, sweeteners, and sugar for the food and beverage industry, and animal feed ingredients for the agriculture industry. In the financial year 2006/07, Danisco had approximately 10,423 employees, net sales of DKK 20.4 billion, and EBITA of DKK 2.2 billion.

Danisco's focus on knowledge, innovation, and know-how is supported by its slogan "*First you add knowledge...*" One of Danisco's objectives is to acquire knowledge and thus create value and growth: in the financial year 2006/07, Danisco spent DKK 874 million on innovation, representing 4.3 percent of sales.

With its 'One-Stop-Supplier' strategy, Danisco provides holistic, all-product solutions to customers. This means that the sales organization is required to work closely together with the research and development departments in all nine product divisions as well as the different production sites. The complexity of this strategy thus puts great demands on knowledge sharing across divisions and departments. The administration of knowledge management in Danisco is located in 'Global Innovation', Danisco's research and development organization, and contrary to, for example, consulting firms, enterprise critical knowledge in Danisco relates to specific products and processes.

Danisco's knowledge and innovation focus is further supported by its espousment of five values: "We create value", "We are innovative", "We build competencies", "We take responsibility", and "We believe in dialogue". What is relevant with regard to knowledge

sharing is that the company claims that it is open-minded about new ideas and new ways of doing things. Additionally, it focuses on continuous learning and dialogue in an organization without boundaries.

Chr.Hansen is an international supplier of natural ingredient solutions for the food, pharmaceutical, nutritional, and agricultural industries. It is globally present with production facilities on three continents, employing 2,498 employees in 29 countries. Development centers are situated in Denmark, the US, France, and Germany, and application centers are found in 21 countries. In the financial year 2005/06, Chr.Hansen achieved revenues of DKK 3.767 million and EBITA of DKK 308 million.

The strong commitment and ongoing efforts in innovation and development have in the case of Chr.Hansen resulted in the adoption of the corporate slogan “130 years of innovation”. Chr.Hansen has some institutionalized practices for knowledge sharing. It is reported that project kick-offs and information meetings are held and that such initiatives to some extent promote knowledge sharing by informing co-workers about current projects. International seminars, cross-cultural management groups, and expatriation are further initiatives implemented in order to overcome the challenge of geographical distance and thereby increase opportunities for knowledge sharing. When it comes to the sharing of explicit knowledge, the company has databases capturing and reporting various projects, recipes, and techniques. However, these databases are somewhat restricted for outsiders as a great deal of the knowledge processes that take place at Chr.Hansen are classified as confidential.

Survey. In order to gain access to the survey participants in Danisco, local HR managers at fourteen different food ingredient production sites, located in eleven different

countries, were contacted by e-mail from corporate HR and asked to nominate approximately 20 employees each to participate in the survey. All in all, 281 invitations to participate in the survey were sent out. In the Americas, three sites in the USA and one site in Mexico were contacted. In Europe, two sites in Denmark and one site each in the UK, Belgium, Finland, and Germany were contacted. In the Asia-Pacific region, one site each in China, Malaysia, and Australia/New Zealand was contacted. 221 questionnaires were filled in and 219 questionnaires were usable for the analysis. This equals a total response rate of 78 percent. The German subsidiary, by appeal from its works council, was not permitted to participate in the survey because it was not available in the local language – German. The higher number of responses in Denmark and the US (48 respondents each) is attributed to the fact that in Denmark, two Danisco sites participated, and in the US, three Danisco sites participated in the survey.

The data collection at Chr.Hansen was initiated by a manager of the knowledge management project group. The invitations were distributed internally within functional areas such as R&D, production, marketing, and sales. More specifically, the questionnaire was distributed among 350 Chr.Hansen employees in Denmark, France, and the US. The reason for choosing these three specific countries lies in the fact that they all have organized R&D activities. 251 responses were returned, giving a response rate of approximately 72%. Approximately half of the respondents come from Denmark (153 responses), 59 from the USA, and 26 from France.

The respondents are described in Table 1. After consultation with each company's representative, the distribution of the survey responses was regarded as representative.

- INSERT TABLE 1 ABOUT HERE -

With respect to possible common method bias, the performance variables were placed after the independent variables in the survey in order to diminish, if not avoid, the effects of consistency artifacts (Podsakoff and Organ, 1986; Salancik and Pfeffer, 1977). Moreover, as a post hoc analysis of the potential common method bias, we carried out a Harman one-factor test. The test assumes that if a large amount of common method bias is present, the test will result in either a single factor or a “general” factor that accounts for a very high level of the covariance in the variables in the model. Our sample does not seem to have this potential hazard since when including all eighteen items (manifest variables) we obtained seven factors with eigenvalues above 1 and the two first factors only explained 22% and 14% of the variance, respectively.

MEASURES

We used perceptual measures for operationalization of all variables in this study. Perceptual measures are recommended for studies of human behavior in general (Spector, 1994, Howard, 1994) and are widely used in studies on knowledge sharing. Further, using perceptual measures of individuals allowed us to capture the actual implemented management mechanisms or practices in use, instead of intended practices designed on a strategic level (Wright and Nishii, 2005).

Knowledge sharing behavior refers to individuals’ observable actions in terms of knowledge sharing. When aggregated, individuals’ knowledge sharing behaviors result in a higher degree of knowledge transfer within the organization. Hence, we adopted a measure for knowledge transfer from Minbaeva et al. (2003), but modified for the

individual level, which captures the acts of the individuals. We asked individual respondents to indicate the extent to which they gained and used knowledge from colleagues in their departments.

Intention to share knowledge is a measure of individual's readiness to perform a given behavior. "If one wants to know whether or not an individual will perform a given behavior, the simplest and probably most efficient thing that one can do is to ask the individual whether he intends to perform that behavior" (Fishbein and Ajzen, 1975: 369). We tried to capture participants' intentions by asking respondents to indicate the extent to which they agree with the following statements: "Increased value for my department is enough to motivate knowledge sharing" and "Increased value for me is enough to motivate knowledge sharing."

Attitude toward knowledge sharing is defined as the degree to which one's feelings about sharing one's knowledge are positive (Brock et al. 2005). In other words, it is the degree to which knowledge sharing behavior is positively or negatively valued. According to Fishbein and Ajzen (1975), standard attitude-scaling methods take an indirect approach by attempting to infer the person's location on the evaluative dimension on the basis of the person's responses to a set of opinion items. Following the same logic, respondents were asked to indicate agreement or disagreement with two items capturing attitude toward knowledge sharing (adopted from Husted and Michailova (2002): "It is important to keep one's ideas secret until one can be recognized as the source of the idea" and "The knowledge one shares reduces the incentives for other people to do the work themselves."

Subjective norm is an expression of the individual's perception of social normative pressures. It is expected that "organization members who share a vision will be more likely to become partners sharing or exchanging their resources" (Tsai and Ghoshal, 1998: 467). We asked respondents to indicate to what extent they agree with the following two statements: "Knowledge sharing is valued in my company" and "Knowledge sharing is valued in my department."

Perceived control refers to an individual's perceived ease or difficulty of performing the knowledge sharing behavior. It is about perceived power of specific factors to facilitate or inhibit performance of the behavior. As indicated above, individual perception of how acceptable mistakes are in the organization could influence individuals' willingness to share knowledge (Husted and Michailova, 2002). Accordingly, respondents were asked to reflect on the following two questions: "I feel I have the right to make mistakes when I do my job" and "I do not have difficulties telling others about my own mistakes."

External rewards is a measure of the extent to which an individual perceives that external rewards are used for promotion of knowledge transfer. Two items were used to capture the use of this governance mechanism: the respondents were asked to evaluate the extent to which they are currently rewarded for transferring knowledge by "increments/bonuses" and "by promotion."

Reciprocal schemes. We asked the respondents to evaluate the extent to which they are "rewarded" for transferring knowledge by the following mechanisms associated with reciprocity: "acknowledgement of my contribution", "a better reputation", "respect as an expert", and "professional and personal development."

Communication mechanisms. The extent to which communication is used to facilitate knowledge sharing was measured by three items (adopted from Bresman et al., 1999). The respondents were asked to indicate the extent to which they use: 1) face-to-face communication, 2) meetings, and 3) informal communication (coffee breaks, social events, etc.) in sharing knowledge.

The exact wording and scales of the survey questions are listed in Table 2.

- INSERT TABLE 2 ABOUT HERE -

Validity of the model

The hypotheses are tested in a LISREL model, which allows for simultaneous formation of underlying constructs (the measurement model) and testing of structural relationships among these constructs (the structural model).

First, a measurement model is created in order to assess the convergent and discriminant validity of our constructs. To ascertain whether the constructs are internally coherent, we report several tests of *convergent validity* in Table 2 that are based on the saturated measurement model, where all interfactor correlations are specified (Joreskog & Sorbom, 1993). First, the strength of the linearity in relations between constructs and items – the R-squared values – is shown in Table 2. In all cases, the strength of the linearity is relatively strong with an R-squared value of 0.42 or above, which is clearly above the usual threshold of 0.20 for the R-squared value (Hair et al., 1995). From Table 2 we can also conclude that the (standardized) factor loadings are strong (all above 0.65). Second, the reliability of each construct is calculated and all of them are above the recommended threshold. Also, in regard to the variance extracted, the overall model is clearly very

robust as all constructs are above the recommended threshold of 0.50. All in all, the measurement model and the presented measures provide strong support for the convergent as well as the discriminant validity of our constructs.

The purpose of the LISREL analysis is to arrive at and confirm a model consisting of specified causal relations. Thus, in the test, we generate a structural model that contains significant relationships in accordance with the stipulated hypotheses. We test single causal relations with *t*-values and factor loadings between the constructs in the model. Goodness-of-fit indexes are critical for the evaluation of the entire model. However, given their complexity, there is no consensus regarding the “best” index of overall fit for structural equations. Thus, reporting multiple indexes is encouraged (Bollen, 1989).

Goodness-of-fit. We assess the entire model by different goodness-of-fit measures including the chi-square value, and the Goodness of Fit Index (GFI), which measures the distance between the data and the model, i.e., nomological validity (Joreskog and Sorbom, 1993). The model presented has a Chi-square value of $\chi^2[127] = 311.5$ ($p = 0.01$), while the GFI based on residuals has a value of 0.93, representing a good fit of the model to the data (Bollen, 1989). Finally, the Bentler-Bonett NNFI represents the proportion of improvement in fit relative to the null model, while controlling for model parsimony. The obtained value (NNFI=0.91) represents a good fit of the model to the data. In addition, the RMSEA is only 0.06 and therefore below the suggested threshold of 0.08. Thus, the conclusion based on the three measures of GFI, NNFI and RMSEA is that we obtained a good fit of the proposed model to the data.

Furthermore, the theoretical model is compared with the saturated measurement model. The theoretical model is clearly the more parsimonious of these two models with a

Parsimonious GFI and Parsimonious NFI of 0.77 and 0.73, respectively, compared with 0.64 and 0.62 for the measurement model.

The strength of the linearity in relations between constructs and items is shown in Figure 2 as the factor loadings of each item linked to a construct (Hair et al., 1995). In all cases, the strength of the linearity is relatively strong with all factor loadings being above 0.65 and with highly significant *t*-values for all items (the lowest *t*-value being 3.29).

RESULTS

Hypothesis 1, linking the intention to share with the actual knowledge sharing behavior, is strongly supported (see Figure 2). In line with our predictions, we find that the intention to share positively and strongly determines (coefficient: 0.34, $p < 0.01$) knowledge sharing behavior.

- INSERT FIGURE 2 ABOUT HERE -

We also find that the three antecedents of the intention are significantly positive, albeit to varying degrees (Hypotheses 2-4 are supported). The strongest determinant of intentions is the subjective norm (coefficient: 0.39, $p < 0.01$), followed by attitude toward knowledge sharing (coefficient: 0.17, $p < 0.01$), and the perceived control (coefficient: 0.15, $p > 0.01$).

The following three hypotheses on knowledge governance mechanisms are also highly significant ($p < 0.01$). The use of reciprocity schemes (coefficient: 0.44) and the extensive employment of communication mechanisms (coefficient: 0.39) are positively related to subjective norm and perceived control, respectively, confirming Hypotheses 6

and 7. However, contrary to expectations, the use of rewards turns out to have a significant negative impact on attitude toward knowledge sharing (coefficient: -0.23).

The correlations among the three governance mechanisms show that the use of reciprocity schemes is strongly correlated with the use of both external rewards and communication mechanisms. This might indicate that reciprocity schemes are often applied together with other knowledge governance mechanisms.

As a further step in assessing the salience of each of the independent constructs in relation to knowledge sharing behavior, we measured the total effect of each construct on the knowledge sharing behavior, including both direct effects and indirect effects. Our findings, in descending order, were as follows: intention to share (0.39), subjective norm (0.17), attitude toward knowledge sharing (0.07), reciprocity schemes (0.07), perceived control (0.06), communication mechanisms (0.03), and external rewards (-0.01). Put simply, this means that the governance mechanisms that are most important in determining the knowledge sharing behavior are reciprocity schemes and to some extent, communication mechanisms, while the total effect of external rewards is negligible (and negative).

In addition, we compared the theoretical model with two other competing models – that is, the saturated measurement model and a model where all six constructs for individual perceptions and knowledge governance mechanisms are directly linked to the intention to share. The goodness-of-fit statistics for these three models are shown in Table 3. The theoretical model is clearly the most parsimonious model with a Parsimonious GFI and a Parsimonious NFI of 0.76 and 0.73, respectively. The comparison of the model with the direct links to intention to share and the theoretical model, where the links between the

knowledge governance mechanism and individual knowledge sharing are mediated by individual perception variables, clearly shows that the theoretical model is superior, as it has higher values of Parsimonious GFI and Parsimonious NFI. This is a strong indication that the individual perception variables (intention, attitude, subjective norms and perceived control) in fact mediate the effect of the knowledge governance mechanism on individual knowledge sharing behavior.

- INSERT TABLE 3 ABOUT HERE -

CONCLUDING REMARKS

The knowledge-based view has recently been criticized for overlooking individual-level variation in favor of an overriding emphasis on firm-level capabilities (Felin and Hesterly, 2007; Foss, 2007). Our paper is an attempt to respond to that criticism by providing and unfolding some individual-level *explanans*. Theoretically, we build upon the TPB, which identifies the antecedents of a human behavior i.e. the considerations that guide human behavior. We define an individual's decision to engage in a specified behavior (like sharing knowledge) as being determined by the intention to perform the behavior, which in turn is affected by individual attitudes toward knowledge sharing, subjective norms and perceived control. The final model provides strong evidence in support of the argument that the intention to share knowledge is formed as a combination of the social influence (social norms), an individual's confidence in her ability to perform the knowledge sharing (perceived control), and the individual's own attitude toward sharing of knowledge (attitude).

The resultant model goes beyond previous efforts by not only unfolding the individual behavior and considering its determinants (attitude, subjective norms and perceived control) but also by delineating key governance mechanisms that condition the above determinants. By using governance mechanisms such as reciprocity schemes and communication mechanisms, managers can positively affect the individual perception of subjective norms and perceived control, respectively, and thus govern individual knowledge sharing behavior. The use of external rewards seems surprisingly enough to be counterproductive in creating a positive attitude toward knowledge sharing. This implies that we cannot simply pay for knowledge sharing behavior: such behavior can only be encouraged and facilitated (Brock et al. 2005: 89). While such a finding might simply be a reflection of the specific external rewards in the two organizations, traditional theories on motivation (e.g. Vroom, 1964) warn against assuming that a straightforward relationship between extrinsic stimuli and individual behavior exists. Frey (1997) points out that there might be a negative effect of introducing extrinsic motivation to activities that are intrinsic in nature (see also Amabile, 1997). Organ and Konovsky (1989) suggest that rewards might inhibit cooperation. Similarly, Janssen and Mendys-Kamphorst (2004) conclude that introducing financial incentives for agents contributing to a socially desirable outcome tends to decrease the number of contributions. One explanation for this might be that when pecuniary rewards are introduced, an incentive for the individual to withhold knowledge for future gains is also introduced (see also Brock et al., 2005). Finally, as Osterloh and Frey (2000) suggest, when tacit knowledge is involved and multiple-task problems are combined with the problem of ‘free riding’ in teams, intrinsic

motivation enables knowledge transfer under conditions in which extrinsic motivation (and hence the effect of external rewards) fails.

The developed and tested model is not only a response to our need to understand the desired micro-foundations (Felin and Foss, 2005) but also a reaction to practitioners' needs. The comparison of the final model with alternative models including more direct effects of knowledge governance mechanisms on individual knowledge sharing behavior provides strong evidence that this relationship is mediated by the intention to share and its antecedents. It also shows that managers are able to affect the intention to share by using governance mechanisms that influence attitudes toward knowledge sharing, subjective norms and perceived control. The development of these governance mechanisms is dependent on purposeful action and investment, not least on the part of managers with a particular responsibility for knowledge sharing. Management should be able to create the right conditions and stimulate the behavior needed for efficient knowledge sharing by affecting individuals' perceptions. More specifically, they can alter the reciprocal schemes in such a way that positive subjective norms and social influence are promoted. Furthermore, to ensure that individuals feel more confidence in their ability to perform knowledge sharing, management should offer various opportunities for individuals to engage in knowledge sharing behavior, i.e. employ communication mechanisms such as face-to-face communication, meetings, and informal interactions.

Naturally, our research also has limitations. The empirical focus was limited: we examined only two firms, both originating from Denmark (although foreign subsidiaries participated in the survey in both cases). Longitudinal research design would have allowed us to examine the possibility of a lagged effect of governance mechanisms on

antecedents of individual behavior. We also acknowledge the shortcomings of using perceptual instruments to measure all variables. Although we have argued for the suitability of perceptual data for the studies of individual human behavior, it would be useful in future to combine perceptual data with more objective indicators in order to develop more elaborate measures. In relation to the latter, our measure of knowledge sharing behavior is also limited as we only capture the extent to which an individual gained and used knowledge from her colleagues. A more elaborate measure might also include the perception of the extent to which colleagues gained and used knowledge coming from that individual. Finally, since we were very focused on taking advantage of the insights of the TPB, we overlooked (perhaps intentionally) the fact that there might be alternative explanations to knowledge sharing such as organizational culture, social interactions, trust, etc. We did so to focus on the individual (micro) level in this paper. However, future studies should pay more attention to the movement from micro to macro, which in fact, involves a potentially strong interdependence between an individual's action and those of others in the same context, particularly when actions are explicitly "strategic" in the sense that actors take into account the actions of other actors (Abell et al., 2008).

However, even with these limitations we found some interesting results that have potentially important implications for the governance of knowledge sharing between individuals. Our study is also relevant for future research on knowledge sharing in terms of the operationalization of the variables offered, the theoretical model and the focus on individuals engaged in knowledge sharing. Finally, we illustrated the applicability of the TPB for studying individual knowledge sharing behavior and its antecedents.

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Figure 1. The motivation sequence (Figure 1 in Locke, 1991)

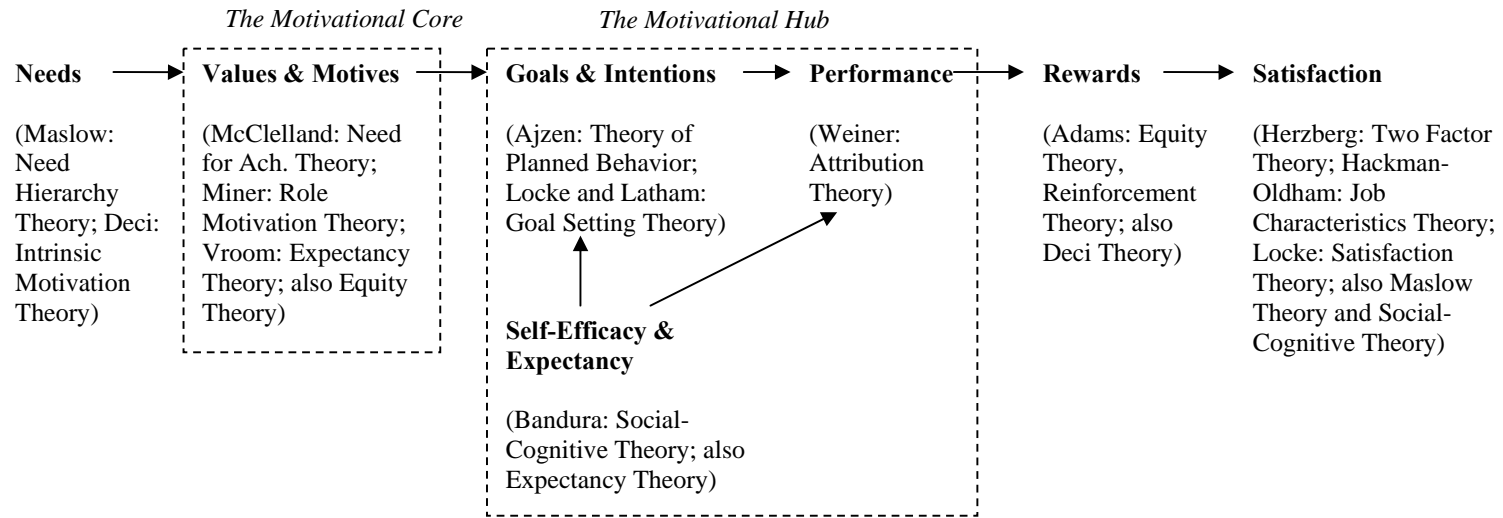


Figure 2. Theoretical model

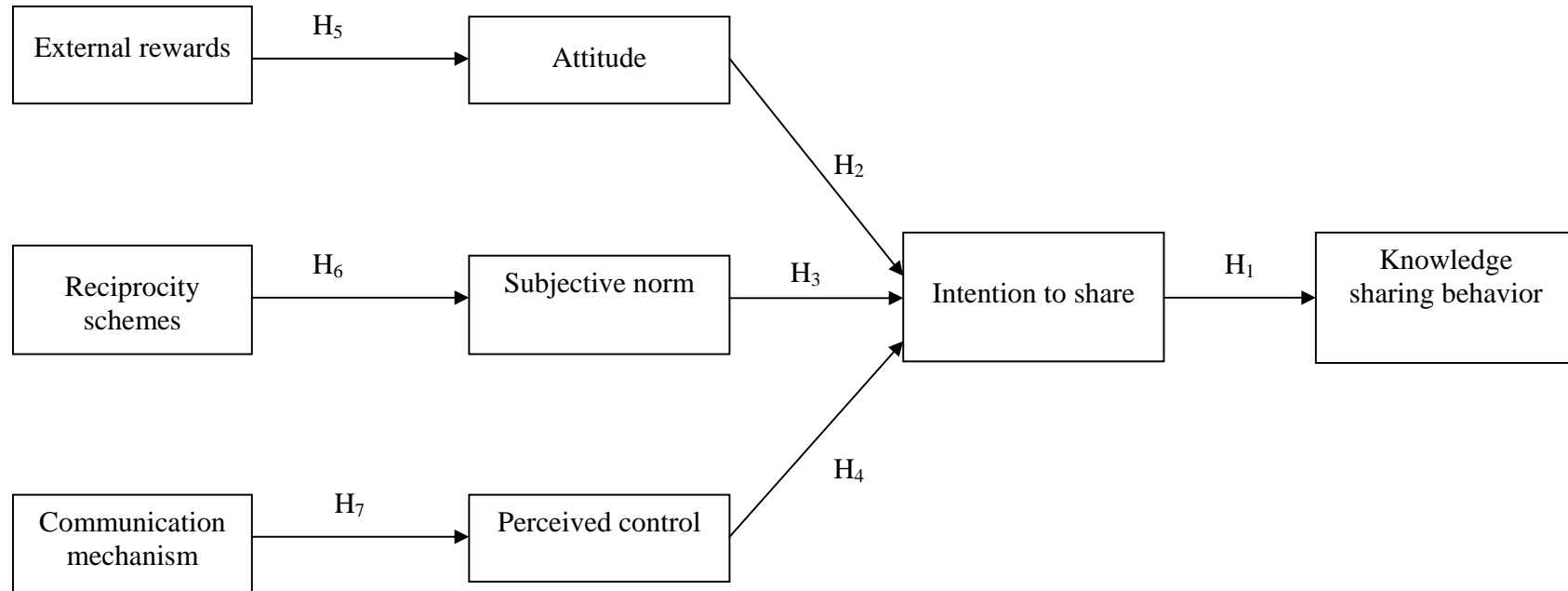
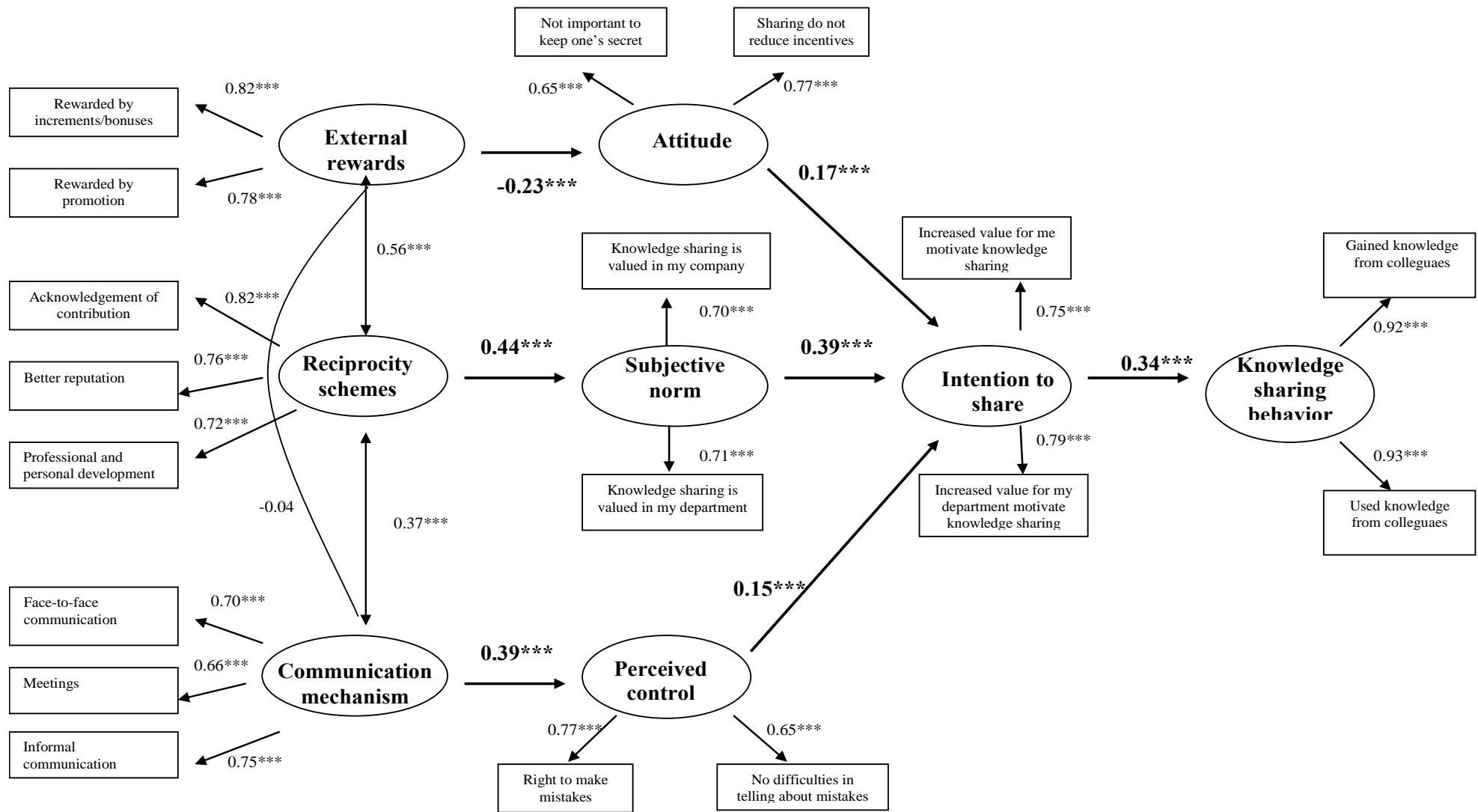


Figure 3. Empirical model



*, ** and *** are 1%, 5% and 10% level of significance, respectively

Table 1. Description of the respondents

| | | Danisco | Chr.Hansen |
|--------------------|----------------------|----------------|-------------------|
| Gender: | Male | 125 | 139 |
| | Female | 91 | 112 |
| | Non-response | 3 | 0 |
| Position: | Low | 118 | 80 |
| | Middle | 69 | 84 |
| | Top | 30 | 81 |
| | Non-response | 2 | 6 |
| Experience: | Average | 9.48 | 8.34 |
| Age: | Average | 39.52 | 40.91 |
| Education: | High school or below | 43 | 27 |
| | Bachelor's degree | 99 | 99 |
| | Master's degree | 70 | 88 |
| | Ph.D. | 5 | 37 |
| | Non-response | 2 | 0 |
| Country: | Australia | 6 | |
| | Belgium | 17 | |
| | China | 13 | |
| | Denmark | 48 | 153 |
| | Finland | 15 | |
| | France | | 26 |
| | Malaysia | 19 | |
| | Mexico | 20 | |
| | New Zealand | 9 | |
| | Sweden | | |
| | the UK | 20 | |
| | USA | 48 | 59 |
| | Other | 4 | 13 |
| Total | | 219 | 251 |

Table 2. Constructs and items

| Constructs and items | Factor loading* | R ² -value | Construct Reliability | Variance extracted by construct |
|--|-----------------|-----------------------|-----------------------|---------------------------------|
| Knowledge sharing behavior | | | 0.92 | 0.86 |
| To what extent have you... | | | | |
| ... <i>gained</i> knowledge from colleagues <i>in your own department</i> ? | 0.92 | 0.84 | | |
| ... <i>used</i> knowledge from colleagues <i>in your own department</i> ? | 0.93 | 0.86 | | |
| (Scale from 1 – little or no extent to 5 - very large extent) | | | | |
| Intention | | | 0.75 | 0.59 |
| To what extent do you agree with the following statements? | | | | |
| Increased value for my department is enough to motivate knowledge sharing. | 0.79 | 0.62 | | |
| Increased value for me is enough to motivate knowledge sharing | 0.75 | 0.57 | | |
| (Scale ranging from 1 – strongly disagree to 5 – strongly agree) | | | | |
| Attitude | | | 0.67 | 0.51 |
| It is important to keep one’s ideas secret until one can be recognized as the source of the idea (reverse coded) | 0.65 | 0.42 | | |
| The knowledge one shares reduces the incentives for other people to do the work themselves (reverse coded) | 0.77 | 0.60 | | |
| (Scale ranging from 1 – strongly disagree to 5 – strongly agree) | | | | |
| Subjective norm | | | 0.67 | 0.50 |
| To what extent do you agree with the following statements? | | | | |
| Knowledge sharing is valued in my company | 0.70 | 0.50 | | |
| Knowledge sharing is valued in my department | 0.71 | 0.51 | | |
| (Scale ranging from 1 – strongly disagree to 5 – strongly agree) | | | | |
| Perceived control | | | 0.67 | 0.51 |
| To what extent do you agree with the following statements? | | | | |
| (Having your <i>department</i> in mind) | | | | |
| I feel I have the right to make mistakes when I do my job | 0.77 | 0.60 | | |
| I do not have difficulties telling others about own mistakes | 0.65 | 0.42 | | |
| (Scale ranging from 1 – strongly disagree to 5 – strongly agree) | | | | |
| Rewards | | | 0.78 | 0.64 |
| To what extent are you currently rewarded for transferring knowledge in your company? | | | | |
| By increments/bonuses | 0.82 | 0.67 | | |
| By promotion | 0.78 | 0.60 | | |
| (Scale ranging from 1 – little or no extent to 5 – very large extent) | | | | |
| Reciprocity | | | 0.81 | 0.59 |
| To what extent are you currently rewarded for transferring knowledge in your company? | | | | |
| By acknowledgement of my contribution | 0.82 | 0.67 | | |
| By a better reputation | 0.76 | 0.57 | | |
| By professional and personal development | 0.72 | 0.51 | | |
| (Scale ranging from 1 – little or no extent to 5 – very large extent) | | | | |
| Communication | | | 0.75 | 0.50 |
| To what extent do you use the following media when you transfer knowledge with other people in your company? | | | | |
| Face-to-face communication | 0.70 | 0.50 | | |
| Meetings | 0.66 | 0.44 | | |
| Informal communication (coffee breaks, social events, etc.) | 0.75 | 0.57 | | |
| (Scale ranging from 1 – never to 5 – very often) | | | | |

* all factor loadings have t-values above 3 and are highly significant at $p < 0.001$

Table 3. Goodness-of-fit statistics for three competing specification of the model

| | 1 | 2 | 3 |
|-----------------------------|--------------------------|---|--------------------------|
| | Measurement model | Direct links: Six constructs → Intention → Knowledge sharing | Theoretical model |
| Chi-square (d.f.) | 163.0 (102 d.f.) | 230.2 (116 d.f.) | 311.5 (126 d.f.) |
| Goodness-of-Fit Index (GFI) | 0.96 | 0.95 | 0.93 |
| GFI adjusted for d.f. | 0.93 | 0.92 | 0.91 |
| Parsimonious GFI | 0.64 | 0.72 | 0.76 |
| RMSEA | 0.04 | 0.06 | 0.05 |
| NNFI | 0.96 | 0.94 | 0.91 |
| Parsimonious NFI | 0.62 | 0.69 | 0.73 |

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