ENCOURAGING KNOWLEDGE SHARING AMONG EMPLOYEES: HOW JOB DESIGN MATTERS

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Job design is one of the most frequently researched practices in the Human Resource Management (HRM) literature, and knowledge sharing has become an important and heavily researched managerial practice. The links between these practices, however, have received little attention in the literature. We argue that job design matters to knowledge sharing for motivational reasons. Specifically, jobs contain characteristics that stimulate different kinds of motivation toward knowledge sharing, which have different effects on individual knowledge sharing behavior. We develop six hypotheses that unfold these ideas and test them on the basis of individual-level data collected within a single firm. The hypotheses are tested in a LISREL model that confirms that job characteristics, such as autonomy, task identity, and feedback, determine different motivations to share knowledge, which in turn predict employees' knowledge sharing behaviors. © 2009 Wiley Periodicals, Inc.

Keywords: job design, job characteristics, types of motivation, knowledge sharing

Introduction

Job design has been one of the most frequently researched Human Resource Management (HRM) practices. Among other things, the importance of job design derives from the impact it may have on employee motivation (Lawler, Hackman, & Kaufman, 1973). We argue that job design may impact specific employee motivations to share knowledge. For this reason, job design is an antecedent of actual knowledge-sharing behaviors in organizations. Job design may

therefore be an important design variable for firms that want to benefit from employees' sharing of relevant knowledge. Such sharing may be particularly pertinent when there is a risk that highly knowledgeable employees may leave the organization or when there are high costs of retaining such talent—pressing problems for many consulting, accounting, and professional services firms that knowledge sharing may alleviate.

The idea that job design can influence pooling employee knowledge is not new. Job-sharing systems require knowledge overlap, and firms may adopt self-managing teams

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to increase the overlap of employees' knowledge. Organization theorists have long maintained that such outcomes of job design as specialization may influence employee knowledge overlap and communication. Such reasoning, however, has usually placed *cognitive* factors center stage. For example, heavy specialization decreases the cognitive ability to absorb knowledge and may thus impede knowledge sharing (e.g., Aoki, 1986; Lawrence & Lorsch, 1967). In contrast, we argue that job design matters to knowledge sharing for fundamentally *motivational* reasons. As has been known at least since Hackman and Oldham (1975; 1976), management can design jobs to influence variables such as autonomy, task identity, and the degree of feedback the employee receives. These job characteristics impact employee motivation to share knowledge, albeit in different ways, and eventually affect knowledge-sharing behavior. Managers who wish to design their organization to pool employee knowledge better should take these motivational effects into account.

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Our argument links to the recent strategic HRM research stream on knowledge-based competitive advantage (e.g., Kang, Morris, & Snell, 2007; Lepak & Snell, 1999, 2002). A growing body of empirical work (e.g., Cabrera, Collins, & Salgado, 2006; Laursen & Foss, 2003; Minbaeva, Pedersen, Björkman, Fey, & Park, 2003) discusses HRM practices as means to improve firm-level knowledge sharing and creation. Yet, the literature fails to "adequately address how firms can manage the *knowledge flows* across different employee cohorts" (Kang et al., 2007, p. 243; italics in original). We capture this by focusing on the impact of job design on employees' motivation to share knowledge. We thereby provide an individual-level perspective that is complementary to the organizational-level emphasis in the strategic HRM literature. This approach is warranted because knowledge sharing takes place among the organization's individual employees (cf. Felin & Foss, 2006; Felin & Hesterly, 2007).

The following section introduces our theoretical framework building blocks. We draw on social psychology research on motivation (e.g., Deci & Ryan, 1985; Gagné & Deci, 2005). Overall, we hypothesize a causal chain leading from (1) adopting certain kinds of job design that (2) result in particular job characteristics that (3) impact employee motivation to share knowledge, which in turn (4) affects employees' knowledge-sharing behaviors (sending and receiving knowledge). We put forward six hypotheses and test them on the basis of individual-level data collected within a single firm. Conducting a one-site survey allowed us to focus on individual-level issues, since many other factors, such as firm-, industry-, and country-specific factors, are kept constant by design (cf. Siggelkow, 2007).

Theoretical Framework and Constructs

Knowledge Sharing

Knowledge sharing is an important part of building knowledge-based competitive advantage (Argote & Ingram, 2000; Cohen & Levinthal, 1990; Kogut & Zander, 1992). Knowledge sharing can be studied and managed at organizational, group, and individual levels of analysis (Jackson, Chuang, Harden, & Jiang, 2006). The premise of the present research, however, is that organizational and group knowledge sharing are always ultimately rooted in individual behaviors and their drivers (here, individual motivation to share knowledge). More broadly, arguments that posit links between organizational variables, such as HRM practices, and organizational outcomes, such as organizational-level knowledge sharing, must refer to individual-level mechanisms—that is, individuals' motivations, cognition, and behaviors, and the interaction among those individuals (Coleman, 1990; Elster, 1989; Felin & Foss, 2006).

Knowledge sharing often involves mutual exchanges among individuals, including

sending and receiving knowledge. It is a relational act based on a sender-receiver relationship that incorporates communicating one's knowledge to others as well as receiving others' knowledge (Hooff & de Leeuw van Weenen, 2004). Knowledge, however, is often highly personal, not easily expressed, and thus difficult to share with others (Kogut & Zander, 1992; Szulanski, 1996). Moreover, we cannot take employee motivation to share knowledge for granted (Cabrera & Cabrera, 2002; Osterloh & Frey, 2000). Organizational instruments can nevertheless be deployed to foster knowledge sharing motivation and thus positively influence knowledge sharing. While researchers have given considerable attention to reward schemes (e.g., Beugelsdijk, 2008; Minbaeva et al., 2003; Minbaeva, 2005), they have seldom, if ever, explicitly considered job design as an antecedent of knowledge sharing.

Job Design and Job Characteristics

Job design is a fundamental HRM activity. It refers to deciding on the actual job structure—that is, identifying the relevant tasks and activities and allocating them across employees in a way that allows the organization to reap benefits from specialization, as well as bundling job tasks to take into account possible synergies between tasks. Traditionally, job design has focused on the job itself rather than on the specific individuals who are to assume the job. Yet, researchers have long known that job design has motivational consequences (e.g., Lawler et al., 1973).

Jobs possess certain characteristics that have psychological implications. The three critical psychological states that the relevant literature has focused on are (1) the experienced meaningfulness of the work, (2) the experienced responsibility for work outcomes, and (3) knowledge of the actual results of one's own work efforts (e.g., Parker & Wall, 1998). Recently, researchers have extended this focus with constructs such as "felt responsibility for constructive change" (Fuller, Marler, & Hester, 2006), "perceived social impact" (Grant, 2008a), "trust by others and self" (Clegg & Spencer, 2007; Langfred, 2007),

and "motivation to make a prosocial difference" (Grant, 2007). Although such recent contributions are clearly valuable extensions of Hackman and Oldham's (1976) job characteristics theory, the three psychological states introduced in the original theory may encompass such aspects. As developed by Hackman and Oldham (1976) and Sims, Szilagyi, and Keller (1976), job characteristics theory states that three groups of core job characteristics activate the three critical psychological states mentioned previously. Accordingly, we label the three job characteristics that correspond to these three psychological states "autonomy," "task identity," and "feedback" (Fried, Oldham, & Cummings, 2001), respectively.

Autonomy concerns whether the job gives the employee the opportunity to decide when and how to carry out specific tasks. In other words, autonomy is "the degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out" (Hackman & Oldham, 1976, p. 258). Many studies have established the importance of job autonomy by finding positive relations between job autonomy and, for example, the proclivity to act proactively (Parker, Wall, & Jackson, 1997), personal initiative (Frese, Kring, Soose, & Zempel, 1996), and felt responsibility (Fuller et al., 2006; Parker et al., 1997). Moreover, a high degree of autonomy may allow the employee to free up time for learning and development (Latham & Pinder, 2005, p. 493).

Task identity is the degree to which the job gives the employee the opportunity to undertake job tasks from beginning to end. That is, task identity relates to whether an employee completes a whole, identifiable piece of work (Hackman & Oldham, 1976). Identifying with one's job tasks is important for how meaningful the employee perceives the job to be, which has considerable implications for an employee's motivation in a given job (Gagné & Deci, 2005).

Knowledge sharing is an important part of building knowledge-based competitive advantage.

Feedback is the degree to which the employee receives direct and clear information about his or her performance as the person carries out the job tasks. Hackman and Oldham (1975) distinguish between two types of feedback: one that is a characteristic of the job itself and one that stems from other agents such as managers (e.g., through practices such as evaluation and recognition schemes or more informal verbal feedback). Strictly speaking, the latter type of feedback is not conventionally seen as a job characteristic but rather as an HRM practice. There is a case to be made, however, for the notion that both types of feedback are important to the employees' perception of their job characteristics. Receiving feedback on one's performance is a critical element of feeling competent in the job and is thus a strong predictor of motivation and performance (Deci, Koestner, & Ryan, 1999).

Intrinsic motivation to engage in knowledge sharing implies employees find the activity itself interesting, enjoying, and stimulating.

Types of Motivation

Important theories of work motivation approach it as a unitary concept that solely varies in strength but not in kind (e.g., Locke & Latham, 2002; Vroom, 1964). Different types of motivations, however, may lead to different performance qualities (Deci & Ryan, 2000; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). Moreover, "differentiating motivation and goals provides an integrated means of relating characteristics of tasks and interpersonal environments, as well as individual differences, to types of performance and well-being" (Gagné & Deci, 2005, p. 341). That is, motivation management can better be tailored to the specific needs of a particular job when different types of motivation are taken into account. Related to this reasoning, some work motivation theories distinguish between different types of motivation—notably, intrinsic and external motivation (e.g., Frey, 1997; Osterloh & Frey, 2000).

External motivation means that an individual engages in an activity to attain a positive or to avoid a negative external outcome; thus, the reason underlying the behavior is not inherent in the behavior itself but rather is instrumental in obtaining separate outcomes. Typical external motivators include external rewards, such as money and praise, as well as avoidance of punishment. Typically, other individuals such as managers, colleagues, and customers administer such contingencies. Individuals thus feel pressured from the outside when externally motivated.

In contrast, *intrinsic* motivation involves doing an activity because it is in accord with the individual's intrinsic interest and personal values (Ryan & Deci, 2000). The employee derives enjoyment from conducting the behavior *per se* (Deci, 1971; Gagné & Deci, 2005; Lepper, Greene, & Nisbett, 1973). An intrinsically motivated individual is mainly absorbed in the process of doing an activity, whereas an externally motivated individual is concerned with the external outcome attained from doing the activity. Intrinsic motivation therefore implies that the individual is free from pressure and tension when engaging in a particular behavior (Deci & Ryan, 1985).

Deci and Ryan (1985, 2000) argue that we need an even more fine-grained motivation typology to understand human behavior and its consequences more fully. An individual can internalize external demands such that behavior is self-regulated yet not intrinsically motivated. Consequently, Deci and Ryan suggest additional motivation types, including *introjection*, which occurs when an individual "takes in" an external regulation but does not accept it as his or her own (Deci & Ryan, 1985). This implies that the behavior is no longer contingent on others' external rewards and punishments. Instead, the individual monitors and administers sanctions and rewards to himself or herself (Deci & Ryan, 1985). An important hallmark of introjected motivation is to promote feelings of worth (Ryan, 1995; Ryan, Koestner, & Deci, 1991). Introjected motivation is in accordance with the "ought self-regulation" of regulatory focus theory (Higgins, 1997). That is, the individual is not acting on verbalized expectations and demands but rather on how the person believes others want him or her to

behave. In this sense, the individual feels controlled by an external source.

Hypotheses Development

We are interested in understanding how different aspects of job design, through their impact on job characteristics, foster certain types of intrinsic, introjected, and external motivation, as well as how these types of motivation influence an employee's knowledge-sharing behavior. We develop our hypothesesin the following; Figure 1 summarizes the theoretical model.

The Motivation to Share Knowledge

Knowledge Sharing and Intrinsic Motivation

Intrinsic motivation to engage in knowledge sharing implies employees find the activity itself interesting, enjoying, and stimulating. In a broader perspective, social psychology research argues that intrinsically motivated individuals are proactive and get involved in activities to promote their own personal growth (Deci & Ryan, 2000). Many empirical studies show intrinsic motivation promotes highly valued behavioral outcomes, such as creativity (Amabile, 1993), quality (Kruglanski, Friedman, & Zeevi, 1971), and learning (Vallerand & Bissonnette, 1992; Vansteenkiste et al., 2004).

It is reasonable to expect that intrinsic motivation will have the same positive effects on knowledge sharing as it has on other learning activities. In fact, several scholars argue that intrinsic motivation is particularly

likely to matter for knowledge sharing (Cabrera et al., 2006; Lin, 2007; Osterloh & Frey, 2000). Empirically, researchers have consistently shown that the impact of motivational factors such as self-efficacy, development, and enjoyment often associated with intrinsic motivation enhance knowledge sharing (e.g., Bock, Zmud, Kim, & Lee, 2005; Burgess, 2005; Cabrera et al., 2006; Lin, 2007; Quigley, Tesluk, Locke, & Bartol, 2007). We therefore expect that intrinsic motivation is positively related to knowledge sharing:

Hypothesis 1: The more intrinsically motivated employees are to share knowledge, the more knowledge they will (a) receive from and (b) send to colleagues.

Knowledge Sharing and Introjected Motivation

Employees motivated by introjection are concerned with maintaining and enhancing feelings of worth in their social groups (Koestner & Losier, 2002; Ryan & Deci, 2000). In an organizational context, doing a good job that is socially acceptable and that other organizational members view as appropriate becomes a prime mover of the employee's actions. We predict that this motivation type is positively related to knowledge sharing. First, if an employee believes there is an expectation regarding knowledge sharing within the organization, he or she will make an effort to comply with that expectation to maintain feelings of worth. This will lead to high involvement in knowledge sharing (cf. Bock et al., 2005). Second, when an employee wants to fit in and gain
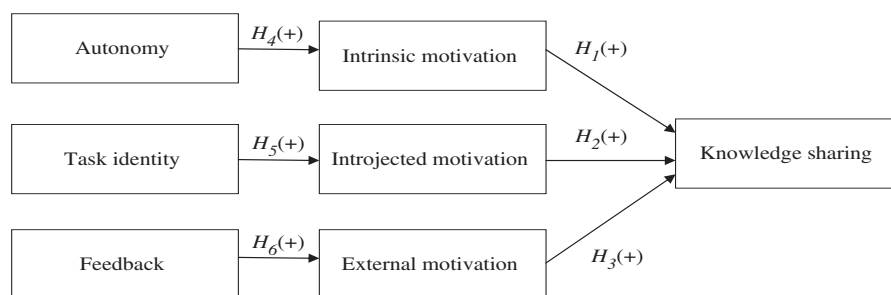

FIGURE 1. Theoretical Model

acceptance in the organization, it becomes important for him or her to solve tasks in accordance with how managers and colleagues expect them to be solved. The employee will be more inclined to rely on others' input and knowledge of how to solve the task correctly and thereby minimize his or her risk of failure. Furthermore, the employee will send knowledge to colleagues to gain acceptance in the organization. This suggests the following hypothesis:

Hypothesis 2: The more introjectedly motivated employees are to share knowledge, the more knowledge they will (a) receive from and (b) send to colleagues.

Knowledge Sharing and External Motivation

Expectancy theory (Vroom, 1964) and expected utility theory assert that an individual's expectations of gains and losses based on subjective probability estimates are the basis for his or her motivation to engage in a certain behavior. Most knowledge-sharing literature investigating the role of motivation is arguably based on such reasoning (e.g., Cabrera & Cabrera, 2002), in which motivating knowledge sharing is a matter of restructuring the payoff function so the employee finds knowledge sharing beneficial. Other types of external motivational factors include formal recognition and feedback, which several scholars consistently argue have a strong positive effect on knowledge sharing (e.g., Cabrera & Cabrera, 2005; O'Dell & Grayson, 1998).

The main characteristic of an employee externally motivated toward knowledge sharing is that some valued external contingency drives his or her involvement in knowledge sharing. Irrespective of the particular external motivational factor in question, we therefore argue that external motivation is positively related to knowledge sharing when the employee values the expected external outcome.

If an employee believes there is an expectation regarding knowledge sharing within the organization, he or she will make an effort to comply with that expectation to maintain feelings of worth. This will lead to high involvement in knowledge sharing.

In addition to the valued outcomes the employee obtains from engaging in knowledge sharing itself, he or she will reap the benefits from others' knowledge when doing his or her own work assignments, which may lead to more of the valued external outcome. In a workplace setting where employees repeatedly interact, we would expect reciprocal behavior to arise. We thus predict that employees who receive knowledge from others and are externally motivated to seek out such knowledge will send knowledge to colleagues in an ongoing knowledge-trading game. In sum, we hypothesize that:

Hypothesis 3: The more externally motivated employees are to share knowledge, the more knowledge they will (a) receive from and (b) send to colleagues.

Job Autonomy

When a specific job is designed to provide the individual with autonomy in planning and conducting the job, his or her sense of responsibility for work-related outcomes is enhanced (Fuller et al., 2006; Hackman & Oldham, 1975). At a general level job, therefore, autonomy (or freedom in the job) is an important mechanism impacting employees' motivation and thus their performance. The social psychology literature broadly supports the argument that the experienced level of autonomy in the environment—including, but not limited to, the autonomy the job itself provides— influences motivation (Gagné & Deci, 2005). The main argument in this literature is that all individuals have three basic psychological needs—for competence, autonomy, and social relatedness—and that satisfying these needs will lead to highly motivated employees. In particular, the need for autonomy is important to the extent that there is a need to maintain intrinsic motivation (Deci & Ryan, 2000). Empirical studies have widely established the importance of autonomy for intrinsic motivation and performance. Deci and Ryan (2000) found that an autonomous work environment is positively related to intrinsic motivation, higher performance, and employee engagement in work. Gagné (2003)

found that autonomy was strongly related to students' engagement in voluntary work as well as other prosocial activities. This indicates a positive relation between autonomy and intrinsic motivation toward knowledge sharing. By designing jobs to enhance the employees' experience of autonomy, managers will thus positively impact their intrinsic motivation to engage in knowledge sharing:

Hypothesis 4: The more autonomy the job provides, the more the employee will tend to be intrinsically motivated to share knowledge.

Task Identity

In addition to job autonomy, Hackman and Oldham (1975) argue that task identity is an important aspect of the job that may lead to high levels of what they call "internal motivation." They argue that once employees begin to understand their tasks as a whole and identifiable piece of work, they will perceive the job as more meaningful. Hackman and Oldham (1975), however, do not distinguish between different types of internal motivation (e.g., intrinsic and introjected motivation). They do not explore how different aspects of their job design framework promote different types of internal motivation and the possible performance differences they may cause. We address this issue by including both intrinsic and introjected motivation.

Whereas job autonomy is associated with the freedom to plan and carry out the job in ways the employee finds most suitable, task identity refers to the employee's following a task through all its stages so he or she, for instance, "provides a complete unit of service" (Hackman & Oldham, 1976, p. 257) instead of just part of it. Task identity concerns identifying with a task or a job others define as well as following procedures others formulate. Designing jobs in accordance with this job design dimension is therefore likely to involve certain expectations regarding how the task should be solved as well as its performance outcomes.

When an employee identifies with his or her tasks, however, the person may internalize external demands and expectations so that he or she no longer needs external contingencies to prompt the desired behavior (Gagné & Deci, 2005). In other words, the employee will tend to internalize the value of tasks to the extent that he or she thinks the tasks make sense and there is a meaningful rationale behind conducting them. Since following a task through all its stages makes the job more meaningful to the employee (Hackman & Oldham, 1976), he or she will initiate such an internalization process. Introjected motivation is thus the result. We therefore hypothesize that:

Hypothesis 5: The greater the degree of task identity the job provides, the more the employee will tend to be introjectedly motivated to share knowledge.

Feedback

Feedback on the job is another mechanism researchers argue to be important to an employee's motivation, satisfaction, and performance. Hackman and Oldham (1975) argue that an employee who receives feedback as a natural part of the job will tend to experience the positive outcomes mentioned earlier. Job design and characteristics theory also emphasizes the importance of other types of feedback such as those from the employee's manager and colleagues (Hackman & Oldham, 1975; Sims et al., 1976).

There is a natural link between external feedback and external motivation: When an employee is motivated by feedback in the form of, for example, evaluations and recognition schemes, he or she will behave in certain ways to obtain attractive evaluations or recognition. External contingencies administered by other individuals thus regulate employee behavior. Note that researchers have found unexpected positive feedback to enhance intrinsic motivation, whereas more controlling types of feedback such as anticipated evaluation and positive feedback delivered in a controlling manner are shown to have negative effects on intrinsic motivation

By designing jobs to enhance the employees' experience of autonomy, managers will thus positively impact their intrinsic motivation to engage in knowledge sharing.

(e.g., Deci et al., 1999; Harackiewicz, Manderlink, & Sansone, 1984). A shift in the individual's perceived locus of causality often explains this negative effect—which means that the person shifts from feeling like the initiator of his or her own behavior to behaving for external reasons (in this case, to obtain a positive evaluation and recognition). In other words, external rather than intrinsic motivation is stimulated. It therefore seems reasonable to expect that formal types of feedback are positively related to external motivation.

Related to this, several scholars theorize that feedback mechanisms such as recognition and performance evaluations tied to knowledge-sharing performance may signal that knowledge sharing is important to, and valued by, the organization and thereby positively impact motivation to engage in knowledge sharing (e.g., Cabrera & Cabrera, 2005; O'Dell & Grayson, 1998). Furthermore, a study of determinants of knowledge sharing finds evidence for the importance of feelings of self-efficacy, which may further indicate that, for example, recognition schemes that strengthen the employee's feeling of self-efficacy can have positive effects on knowledge sharing (Cabrera et al., 2006). We thus expect:

> *Feedback mechanisms such as recognition and performance evaluations tied to knowledge-sharing performance may signal that knowledge sharing is important to, and valued by, the organization and thereby positively impact motivation to engage in knowledge sharing.*

Hypothesis 6: The more feedback in the form of formal evaluations and recognition schemes the job provides, the more the employee will be externally motivated to share knowledge.

Methods

We collected all data used in the analysis based on one-site sampling (Tsai & Ghoshal, 1998) at the Copenhagen site of the German multinational company MAN Diesel. This implies that our research design controls for a number of broad contextual factors known to influence intraorganizational knowledge sharing (cf. Siggelkow, 2007). This is a major advantage compared to questionnaires designed to target a large number of firms but only one or a few respondents per organization.

MAN Diesel is the world's leading provider of large-bore diesel engines for marine and power plant applications. It generates revenue through license royalties. Secondary business areas include resale of engines, component sales, and introducing new features for engines already in operation. MAN Diesel employs more than 6,400 staff members, primarily in Germany, Denmark, France, the United Kingdom, the Czech Republic, and China. The Danish subsidiary has designed and produced two-stroke engines for more than 100 years. Engineers and designers located in Copenhagen undertake all research and development (R&D), design, and testing, while the majority of the production (92%) takes place at the licensees in Japan, Korea, and China.

MAN Diesel in Copenhagen is in many respects a typical engineering company, employing mainly machine engineers and other engineers (e.g., in electronics and information technology) with an academic degree. The organizational structure is hierarchical and strongly departmentalized, with clear lines of responsibility flowing from the top to the bottom. The business model, however, requires concerted efforts to navigate and nurture various kinds of relationships with stakeholders and customers, such as shipyards, ship owners, classification societies, authorities, and suppliers. The ability to share knowledge and facilitate innovations within and across departments is therefore a key concern to management.

Research Instrument

We collected the data using an administered questionnaire based on a focused literature review. We pretested the questionnaire with academicians and managers to ensure that individual items and the overall format were easily understood. Further, we tested the questionnaire with the representatives of MAN Diesel to increase the clarity of the questions and avoid interpretation errors.

We used self-reported or perceptual measures for operationalizing all variables in the questionnaire. Self-reported measures are particularly useful in providing a picture of how people perceive and feel about their job-related behavior (Spector, 1994). Researchers recommend perceptual measures for studies of human behavior in general (Howard, 1994) and studies on motivation in particular. Most other studies on intraorganizational knowledge processes also rely on perceptual measures (e.g., Gupta & Govindarajan, 2000; Lyles & Salk, 1996; Simonin, 1999; Szulanski, 1996). Finally, using the perceptual measures allowed us to capture the implemented job design practices, or practices in use that were "perceived and interpreted subjectively by each employee" (Wright & Niishi, 2006, p. 11).

The firm requested a Web-based version of the questionnaire. A firm representative, who mediated collection of the questionnaires, distributed the invitation containing the link to the Web-based survey via the firm's internal e-mail system. To reduce possible social desirability bias, we followed Tsai and Ghoshal (1998), explaining in the questionnaire introduction that the software prevented identification of individuals and that the data would be collected using an external server independent of the firm.

Together with the firm representative, we selected those departments for the survey that are mostly involved in knowledge sharing across individuals and departments (i.e., Engineering, R&D, Sales & Marketing, Technical Service, and Purchasing). We submitted the questionnaire to all individuals in those departments. Of the 505 invitations sent out for participation in the survey, 263 questionnaires were filled in. Because of missing values for some items, however, we were only able to use 186 responses in the data analysis. This equals a usable response rate of 33%. Table I presents a description of the respondents. After consultation with the firm representative, we regarded as representative the distribution of the survey responses.

Although we tested the hypotheses using the survey data, to make our conclusions more robust we triangulated the survey data with data from two follow-up meetings that each lasted two hours with executive officers from MAN Diesel. The discussion of the results took place in two stages. First, we presented the results and pointed out some preliminary findings and reflections on the results. We discussed those findings; in the majority of the cases, the firm executives offered alternative explanations. In return, they pointed to those issues that, in their opinion, were the most interesting and relevant for MAN Diesel. Such design allowed our ideas to "be hatched, tested, and [dis]confirmed in a relatively short period of time" (Chatman & Flynn, 2005, p. 439). It also allowed us to contextualize our findings to the extent possible (cf. Eisenhardt & Graebner, 2007, p. 25).

Measures

In the following sections, we describe the operationalization of the constructs and we then evaluate the different forms of validity. See Table II for the exact wording of questions forming the items.

Knowledge Sharing

Knowledge sharing includes the respondent's both receiving knowledge and sending it. Gupta and Govindarajan (2000) pointed out the importance of distinguishing between receiving and sending knowledge. Davenport and Prusak (1998) similarly argue that knowledge sharing involves two actions: the recipient's transmission and absorption/use of the knowledge. Accordingly, for the *receiving of knowledge*, we asked individual respondents to indicate the extent to which they have gained and used knowledge from colleagues in their own department. Similarly, for the *sending of knowledge*, we asked respondents about the extent to which colleagues in their own department have gained and used the respondent's knowledge. We adopted these measures from Minbaeva et al. (2003) but modified them to the individual level. The four questions used a 7-point scale from 1 (little or no extent) to 7 (very large extent).

The Motivation to Share Knowledge

As pointed out earlier, we approach motivation as a multidimensional construct. Following Deci and Ryan (1985) and Ryan and Deci (2000), we distinguish among intrinsic, intro-

jected, and external motivation. We adopted the scales from the Self-Regulation Questionnaires, which assess different types of motivation (Ryan & Connell, 1989). Using a 7-point scale ranging from "strongly disagree" to "strongly agree," we applied three items/

TABLE I Response Distribution	
	Responses
Distribution by Gender	
Male	159
Female	26
Nonresponse	1
Distribution by Age	
25–34	40
35–44	68
45–54	44
55–64	31
Nonresponse	3
Distribution by Education	
High School or Below	10
Middle-range Training	31
Bachelor's Degree	77
Master's Degree	34
PhD	8
Other	23
Nonresponse	3
Distribution by Years at MAN Diesel	
< 5	42
5–9	38
10–14	36
15–19	30
20–29	22
> 29	15
Nonresponse	3
Distribution by Department	
Engineering	95
R&D	47
Sales & Marketing	11
Technical Service	16
Purchasing	12
Nonresponse	5
Stilling	
Top management	24
Technical (Engineer + Project Manager + Other Technical)	141
Administration (Administrative + Other + Sales)	18
Nonresponse	3
Total	**186**

T A B L E I I Constructs and Items*					
Constructs and Items	**Factor Loading**	**t-value**	**R^2 Value**	**Construct Reliability**	**Average Variance Extracted (AVE)**
Receiving of Knowledge					
To what extent have …				0.88	0.79
… you received knowledge from colleagues in your own department?	0.85	12.41	0.73		
… you used knowledge from colleagues in your own department?	0.93	13.68	0.86		
Sending of Knowledge					
To what extent have colleagues …				0.93	0.87
… in your own department received knowledge from you?	0.99	16.20	0.99		
… in your own department used knowledge from you?	0.87	13.51	0.76		
Intrinsic Motivation					
Why do you share knowledge with others?				0.76	0.51
I think it is an important part of my job.	0.69	8.80	0.47		
I find it personally satisfying.	0.68	6.27	0.46		
I like sharing knowledge.	0.78	9.87	0.60		
Introjected Motivation					
I share knowledge because …				0.87	0.69
… I feel proud of myself.	0.72	10.86	0.52		
… I want my superior to think I am a good employee.	0.90	14.89	0.80		
… I want my colleagues to think I am competent.	0.87	14.33	0.76		
External Motivation					
Why do you share knowledge with others?				0.87	0.64
I want my supervisor(s) to praise me.	0.97	17.57	0.93		
I want my colleagues to praise me.	0.94	16.76	0.88		
I might get a reward.	0.66	9.90	0.43		
It may help me get promoted.	0.58	8.44	0.34		
Autonomy					
To what extent is your job characterized by the following?				0.76	0.51
The freedom to carry out my job the way I want to.	0.72	9.94	0.52		
The opportunity for independent initiative.	0.83	11.61	0.69		
High level of variety in my job.	0.57	7.47	0.33		
Task Identity					
To what extent is your job characterized by the following?				0.76	0.52
The opportunity to complete work that I started.	0.74	7.79	0.54		
The opportunity to do a job from the beginning to the end.	0.75	8.51	0.56		
The opportunity to do my job independently of others.	0.67	5.64	0.45		
Feedback					
To what extent are you included in the following?				0.77	0.53
Formal acknowledgment.	0.70	9.59	0.50		
Performance evaluation.	0.82	11.45	0.67		
Feedback from my superior on my job performance.	0.66	9.01	0.44		

*All variables are measured on a 7-point Likert scale.

questions to capture intrinsic and introjected motivation, while we based the external motivation construct on four items.

Job Characteristics

We adopted measures of job characteristics from Sims et al. (1976), who used Hackman and Oldham's (1975) contribution to develop an improved instrument for job characteristics (the Job Characteristic Inventory) and provided evidence for the instrument's reliability and validity. For both *autonomy* and *task identity*, we used three items on a 7-point scale (from "very little extent" to "very large extent") to measure these variables. We also captured the variable *feedback* by three items. We measured two of the practices—"formal acknowledgement" and "performance evaluation"—on a 7-point scale (from "very little extent" to "very large extent"), while we measured the third item on a 7-point scale ranging from "not at all or very little" to "very much."

With respect to common method bias, we placed the performance variables after the independent variables in the survey to diminish, if not avoid, the effects of consistency artifacts (Salancik & Pfeffer, 1977). In addition, we performed a number of statistical tests to detect potential common method bias. First, we conducted a Harman's one-factor test on the items included in our model. Here we found multiple factors (seven factors with an eigenvalue > 1), and the first two factors accounted for only 21% and 17% of the variance, respectively (Podsakoff & Organ, 1986). Second, we conducted the stronger test of common method bias—the "single factor procedure"—based on confirmatory factor analyses Podsakoff, MacKenzie, and Podsakoff (2003) recommend for this kind of study. We examined the fit of the single factor model in which all items loaded on one factor. The underlying logic is that if method variance is largely responsible for the covariation among the constructs, a confirmatory factor analysis should indicate that a single factor model fits the data. Goodness-of-fit statistics for the single factor model are listed in Table IV; with the Goodness-of-Fit Index (GFI) = 0.85 and

Non-Normed Index (NNFI) = 0.87, the single factor model did not fit the data well. Furthermore, the improved fit of the alternative and more complex models (also reported in Table IV) was statistically significant. While these tests do not eliminate the threat of common method variance, they provide evidence that common method bias does not purely drive interitem correlations.

The correlation matrix in Table III provides further evidence that the data do not suffer from common method bias. In fact, the correlation matrix shows that the correlations, in general, are much higher inside the constructs (as expected) than all other coefficients. For some constructs like the receiving and sending of knowledge and introjected and external motivation, however, the items still have relatively high across-construct correlations (in the range of 0.35 to 0.50), which call for tests of alternative specifications of the model.

Validity and Reliability of Measures

We tested the hypotheses in a LISREL model that allows for simultaneous formation of underlying constructs (the measurement model) and test of structural relationships among these constructs (the structural model). To ascertain whether the constructs are internally coherent, we report several tests of *convergent validity* in Table II, which is based on the saturated measurement model in which all interfactor correlations are specified (Joreskog & Sorbom, 1993). First, the strengths of linearity are relatively strong with R^2 values of 0.33 or above, which is clearly above the usual threshold of 0.20 (Hair, Anderson, Tatham, & Black, 1995). From Table II we can also conclude that the t-values for all items are highly significant (they are all above 5.64) and that their (standardized) factor loadings are strong (all above 0.57). Second, we calculated the correspondence between the items and their constructs (i.e., the construct reliability) for each construct as the share of common variance the construct explains. All eight constructs are above the recommended threshold of 0.70 (see column 5 in Table II) (Gerbing & Anderson, 1988). The construct

T A B L E   I I I Correlation Matrix (*N* = 186)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. Received knowledge from colleagues	**0.89**																						
2. Used knowledge from colleagues	**0.79**	**0.89**																					
3. Colleagues received knowledge from you	0.39	0.38	**0.93**																				
4. Colleagues used knowledge from you?	0.33	0.35	**0.86**	**0.93**																			
5. Important part of my job	0.18	0.29	0.34	0.32	**0.72**																		
6. Find it personally satisfying	0.15	0.20	0.19	0.16	**0.52**	**0.72**																	
7. Like sharing knowledge	0.25	0.33	0.34	0.31	**0.53**	**0.60**	**0.72**																
8. Feel proud of myself	-0.01	0.01	0.02	0.01	-0.01	0.22	0.09	**0.83**															
9. Want my superior to think I am a good employee	0.02	0.03	-0.07	-0.05	-0.06	0.17	0.04	**0.63**	**0.83**														
10. Want my colleagues to think I am competent	0.01	-0.02	-0.01	0.03	-0.06	0.28	0.08	**0.63**	**0.79**	**0.83**													
11. Want my supervisor(s) to praise me	0.03	-0.03	0.01	0.04	-0.12	0.14	0.01	0.50	0.46	0.49	**0.80**												
12. Want my colleagues to praise me	0.06	-0.0	0.01	0.05	-0.1	0.14	0.01	0.42	0.45	0.42	**0.91**	**0.80**											
13. Might get a reward	-0.02	-0.07	0.01	-0.02	-0.07	0.10	-0.02	0.38	0.43	0.37	**0.63**	**0.59**	**0.80**										
14. May help me get promoted	-0.01	-0.06	-0.04	-0.01	-0.06	0.11	0.08	0.38	0.41	0.46	**0.56**	**0.60**	**0.54**	**0.80**									
15. Freedom to carry out my job the way I want	0.09	0.15	0.26	0.21	0.13	0.03	0.24	0.13	0.09	0.20	-0.03	0.01	-0.04	0.02	**0.71**								
16. Opportunity for independent initiative	0.20	0.27	0.32	0.26	0.12	0.02	0.24	0.16	0.08	0.14	0.01	0.01	-0.03	0.06	**0.62**	**0.71**							
17. High level of variety in my job	0.29	0.29	0.33	0.31	0.10	0.11	0.17	0.08	0.06	0.14	0.11	0.13	0.07	0.10	**0.57**	**0.55**	**0.71**						
18. Opportunity to complete work that I started	0.12	0.15	0.01	0.03	-0.03	-0.04	0.11	0.04	0.08	0.10	-0.06	-0.11	-0.01	0.08	0.27	0.34	0.25	**0.72**					
19. Opportunity to do my job independently of thers	-0.07	-0.08	-0.04	-0.04	-0.09	-0.02	0.01	-0.04	-0.01	0.05	-0.09	-0.11	-0.01	-0.03	0.15	0.08	0.06	**0.54**	**0.72**				

TABLE III Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
20. Opportunity to do a job from the beginning to the end	0.03	0.07	0.05	0.08	-0.07	0.01	0.10	0.10	0.13	0.16	-0.04	-0.06	0.01	-0.01	0.18	0.17	0.16	**0.57**	**0.61**	**0.72**			
21. Formal acknowledgment	0.20	0.18	0.17	0.17	0.12	0.21	0.13	0.08	0.08	0.11	0.21	0.17	0.21	0.10	0.10	0.25	0.28	0.19	0.01	0.10	**0.73**		
22. Performance evaluation	0.32	0.31	0.15	0.16	0.12	0.16	0.14	0.17	0.11	0.17	0.19	0.20	0.28	0.10	0.11	0.20	0.27	0.14	0.06	0.11	0.57	**0.73**	
23. Feedback from my superior on job performance	0.28	0.27	0.10	0.15	0.11	0.10	0.13	0.07	0.07	0.09	0.14	0.14	0.16	0.05	-0.01	0.11	0.25	0.05	0.03	0.09	0.56	0.54	**0.73**
Mean	5.78	5.96	5.53	5.44	6.16	5.80	5.99	4.23	4.20	4.74	3.45	3.63	3.10	3.20	5.92	6.06	4.97	5.37	5.25	5.35	3.41	3.26	**3.41**
Std. Dev.	1.21	1.11	1.22	1.25	0.84	1.16	0.90	1.65	1.75	1.57	1.56	1.61	1.39	1.60	1.24	1.20	1.52	1.33	1.42	1.41	1.64	1.64	**1.71**

All coefficients above 0.15 are significant at the 5% level.

reliability varies from 0.76 (three constructs) to 0.92 (the construct for sending of knowledge). Furthermore, Fornell and Larcker (1981) proposed a statistic they termed Average Variance Extracted (AVE) as a measure of convergent validity (i.e., the measure of the error-free variance of the set of items related to a construct). With regard to the AVE statistics, the constructs are clearly robust, as all constructs are above the recommended threshold of 0.50.

We obtained several measures of *discriminant validity* from the data. One suggested test of discriminant validity is the test of whether the correlations and causal paths between the latent constructs are significantly different from 1 (Fornell & Larcker, 1981). By constructing 99.9% confidence intervals around the correlations and causal paths, we can confirm that none of them is close to 1. In addition, one can use the AVE statistics to assess discriminant validity. If the square root of AVE is larger than the correlation with items belonging to other constructs, this suggests that each construct has more internal (extracted) variance than variance shared with other constructs, which indicates the focal construct is indeed different from other constructs (i.e., discriminant validity). The diagonal of Table III shows the square root of AVE-value for all constructs, and none of the correlation coefficients exceeds the values of the square root of AVE. This provides consid-

erable evidence for discriminant validity of each of our eight constructs. In sum, there is strong evidence for validity of our eight constructs. This is also reflected in the goodness-of-fit statistics for the whole measurement model that with GFI = 0.90, NNFI = 0.96, and RMSEA = 0.04 meets the requirements for accepting the model.

The Goodness-of-Fit of the Structural Model

The second step in the analytical process is to form the structural model by specifying the causal relations in accordance with the hypotheses. Through repeated iterations, a LISREL analysis fine-tunes the model to obtain a more coherent representation of the empirical data. We thus generated a structural model that contains relationships in accordance with the stipulated hypotheses. In addition, we allowed the three types of motivation to correlate as we expect some level of correlation between them. We tested 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. Given their complexity, however, there is no consensus regarding the "best" index of overall fit for structural equations. Reporting multiple indexes is thus encouraged (Bollen, 1989).

	0 Single Factor Model	1 Measurement Model	2 Each Job Design Variable Linked to All Three Motivation Variables	3 Dependent Variable = Receiving + Sending of Knowledge	4 *Theoretical model*
TABLE IV Goodness-of-Fit Statistics for Three Competing Specifications of the Model					
Chi-square (d.f.)	418.8 (214 d.f.)	256.4 (202 d.f.)	319.2 (204 d.f.)	561.5 (214 d.f.)	*334.0 (218 d.f.)*
GFI	0.85	0.90	0.88	0.82	*0.90*
GFI adjusted for d.f.	0.80	0.86	0.83	0.76	*0.86*
Parsimonious GFI	0.71	0.72	0.71	0.69	*0.75*
RMSEA	0.07	0.04	0.06	0.09	*0.05*
Comparative fit index	0.89	0.97	0.94	0.82	*0.94*
NNFI	0.87	0.96	0.93	0.79	*0.93*
Parsimonious NFI	0.68	0.71	0.69	0.63	*0.73*

We assessed the structural model by different goodness-of-fit measures, including the chi-square value, the GFI, and the NNFI, which are measures of the distance between data and model—that is, nomological validity (Joreskog & Sorbom, 1993). The theoretical and hypothesized model (i.e., model 4 in Table IV) has a chi-square value of $\chi^2[218] = 334.0$ ($p = 0.01$), while the GFI based on residuals obtains a value of 0.90, which represents 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 = 0.93) represents an equally good fit of the model to the data. In addition, the RMSEA is only 0.05 and therefore is below the suggested threshold of 0.08. The conclusion thus based on the three measures GFI, NNFI, and RMSEA is that we obtained a good fit of the proposed model to the data.

Furthermore, we compared the theoretical model with a number of its alternative specifications, including the saturated measurement model. Table IV provides the comparable statistics for the alternative models. In addition to being compared to the saturated measurement model, the theoretical model is compared with two alternative specifications of the model. In one alternative specification (model 2 in Table IV), each of the three variables of job characteristics is allowed to influence all three motivation variables (i.e., 3 x 3 relationships instead of only the three hypothesized relationships in H4 through H6). By including this model, we test for the possibility of the three job characteristics' affecting other types of motivation than we hypothesized in the theoretical model (Figure 1). In addition, model 3 (in Table IV) presents the goodness-of-fit of the model where the receiving and sending of knowledge are put together in one construct. As Table IV shows, only the measurement model and the theoretical model really meet the required values for the different goodness-of-fit statistics. The model where the receiving and sending of knowledge are collapsed into one measure (model 3) obtained a bad fit (high chi-square values, etc.) and is clearly not an acceptable description of the data. We must therefore reject it. The model linking all job characteristics with all motivation variables performs better and is a borderline case in the sense that some measures such as RMSEA and NNFI are acceptable, while others such as GFI are not. The bottom line is that the theoretical model is clearly the most parsimonious model of the four specifications listed in Table IV. With a parsimonious GFI of 0.75 and parsimonious NFI of 0.73 (that adjust for the higher degrees of freedom in the theoretical model), the theoretical model clearly obtains a better overall goodness-of-fit than the alternatives and therefore provides the best description of the data.

Results

The three hypotheses that link job design and job characteristics to motivation (H4 through H6) are strongly supported (see Figure 2). We find that autonomy is positively (coefficient: 0.39) and significantly ($p < 0.01$) related to the degree of intrinsic motivation, and that the degree to which the job contains task identity is positive and significantly associated with introjected motivation (coefficient: 0.23 and $p < 0.01$). Feedback positively and significantly influences external motivation (coefficient: 0.20 and $p < 0.01$).

H1 through H3 concern the relationships between the three motivation variables and the sharing of knowledge. We find that intrinsic motivation strongly and positively affects both receiving and sending of knowledge (coefficients of 0.50 and 0.57, respectively, and $p < 0.01$ for both). Introjected motivation has a significant and positive impact on sending of knowledge (coefficient: 0.21, $p < 0.05$) but is insignificant in relation to receiving of knowledge. External motivation is insignificantly related to receiving knowledge but unexpectedly negatively related to sending it (coefficient: –0.17). The negative relation, however, is only marginally significant at $p < 0.10$. In sum, H1 concerning intrinsic motivation is confirmed, and H2 on introjected motivation is somewhat supported (for sending of knowl-

*, **, ***: 10%, 5%, and 1% level of significance, respectively
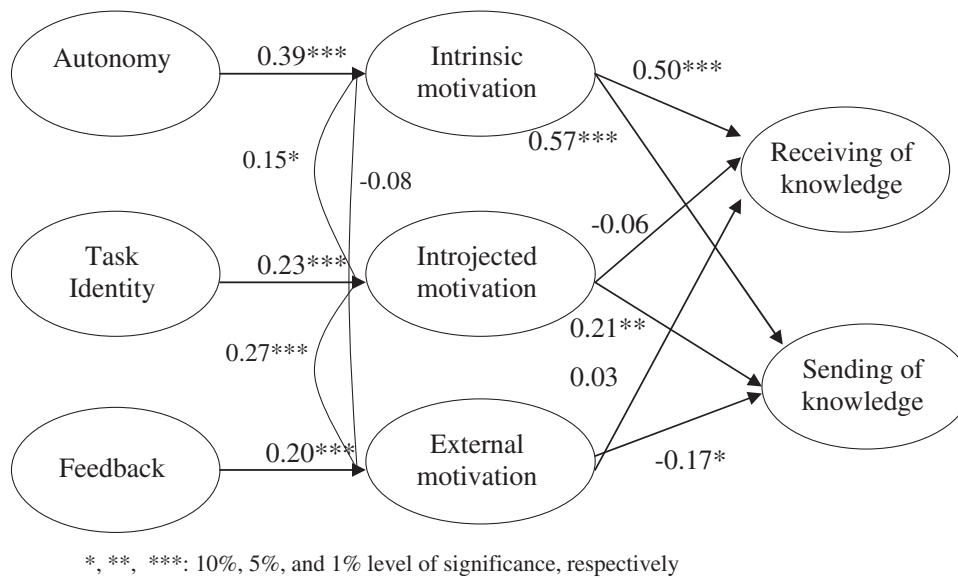
FIGURE 2. Empirical Model

edge), while H3 on external motivation must be rejected.

The R^2 values of receiving and sending knowledge are 0.25 and 0.32, respectively. This is a further indication that individual motivation explains a large proportion of the knowledge-sharing behavior. Furthermore, as we expected, some types of motivation are more closely correlated than others. Introjected motivation is positively (and significantly) correlated with both intrinsic motivation and external motivation, while the two ends of the scale—that is, intrinsic and extrinsic motivation—are uncorrelated.

Concluding Discussion

The main purpose of this research is to further our understanding of how different aspects of job design foster different types of individual motivation (i.e., intrinsic, introjected, and external motivation), as well as how these motivation types influence employees' knowledge-sharing behavior. Our results show that (1) job autonomy increases employees' intrinsic motivation toward knowledge sharing, (2) task identity is positively linked to introjected motivation toward knowledge sharing, and (3) feedback on the job has a positive impact on employees' external motivation to engage in knowledge sharing.

We find that the three types of motivation have strong effects on both sending and receiving knowledge. In particular, all three motivation types affect the extent of knowledge sent to colleagues. While intrinsic motivation has a very strong and positive impact on knowledge sent, introjected motivation has a slightly weaker, yet positive, effect. External motivation, on the other hand, is negatively related to the extent of knowledge sent to colleagues. The reason might be that individuals who engage in knowledge sharing for external reasons strategize more on their knowledge sharing by sharing the amount of knowledge required to obtain external rewards. The extent of knowledge the focal employee receives, however, is only significantly influenced by intrinsic motivation toward knowledge sharing; as we expected, this effect is positive.

The nuanced understanding of motivation in this research reveals that the type of motivation fostered matters, and all types of motivation are not equally desirable for knowledge sharing.

Future Research

The nuanced understanding of motivation in this research reveals that the type of motivation fostered matters, and all types of motivation are not equally desirable for knowledge sharing. This has implications for future research on job design. Recent research has

applied job design theory in related areas such as proactive (Fuller et al., 2006) and prosocial behavior (Grant, 2007, 2008b). We have further expanded its domain of application to knowledge sharing. Specifically, by elaborating on job characteristics conducive to motivation toward knowledge sharing, we take steps in the direction of reorienting job design research toward the emerging knowledge governance approach (Foss, 2007; Grandori, 1997, 2001).

We encourage management to take extra care when designing jobs to incorporate external feedback mechanisms. In general, it is important that employees do not have a sense of external pressure or being manipulated because this may have negative effects on the engagement in knowledge sharing.

Grant (2007) argues that future studies should consider going beyond a rather narrow, limited set of job characteristics defined largely by Hackman and Oldham's (1980) model. We concur and call for future research that provides a deeper understanding of a wider set of job characteristics. It would be beneficial if such research included more social or interpersonal aspects of the job, for example, to reflect better the team-based aspects that characterize many jobs today. While researchers increasingly include constructs such as task interdependence (Guzzo & Shea, 1992; Langfred, 2007) and relational mechanisms (Grant, 2007; 2008a; 2008b) in research models, more work is needed to understand the effects such job design aspects have on motivation to share knowledge. Motivation types such as reciprocity (Fehr & Fischbacher, 2002) and obligation-based (Lindenberg, 2001) motivation are relevant here, as the more social and team-based characteristics possibly are linked to motivation types like these.

Limitations

We have identified the unique and isolated effects of each of the three job characteristics included in our model. This is a simplification of the Hackman and Oldham (1980) model because we do not look at the joint effects of these job characteristics. We did test, however, for alternative specifications of the model like model 2 presented in Table IV, where each of the three job design variables is linked to all three types of motivation. In this model, only the three proposed relationships between job characteristics and motivation (H4 through H6) were significant, while all the other (six relationships) were insignificant. In the same line, none of the other alternative models we tested indicated significant joint effects among the job characteristics.

Further, Hackman and Oldham's (1980) model includes two additional job characteristics our study does not account for—namely, skill variety and task significance—that could possibly have strengthened our model. We suspect that these constructs would have yielded even more importance to intrinsic and introjected motivation relative to external motivation, placing emphasis on the motivation types we already find most important. For example, Grant (2007) links task significance to prosocial motivation, which he in a later study argues may be an introjected form of motivation (Grant, 2008b). On the other hand, skill variety is linked to challenges and feelings of competence, which are often associated with intrinsic motivation (Gagné & Deci, 2005; Ryan & Deci, 2000).

We relied on a cross-sectional design and perceptual measures, which provide us with "fine-grained measures of variables that are otherwise difficult to measure" (Haas & Hansen, 2007, p. 1150). It would be useful in the future, however, to combine data from multiple sources to develop more elaborate measures. Finally, we only examined individuals working for one company located in Denmark. The findings we have reported here thus may be a reflection of company- and country-specific attributes. There is a need for further empirical studies using individual data gathered from a wider variety of firms to generalize our findings further. Still, we are confident that the model developed and tested in this research provides evidence on the role of HRM practices in general, and job design in particular, in governing individual motivation to share knowledge. To test this proposition further, we need to consider a

wider range of HRM practices and introduce more individual-level variables in addition to motivation (e.g., ability and opportunity; cf. Guest, 1997).

Implications for Managers

Since different job characteristics have the potential to enhance certain types of motivation, management needs to consider carefully how it designs specific jobs. Job characteristics theory implies designing jobs that introduce three job characteristics to the maximum degree possible. Our findings call for differentiation. For jobs where the success of employee performance depends on receiving knowledge from other parts of the organization, management must grant the employee sufficient autonomy so intrinsic motivation toward knowledge sharing is strengthened. For jobs where knowledge relevant to others is created, management should foster either intrinsic or introjected motivation to enhance the likelihood of employees' sending knowledge to colleagues. Further, our results show that to stimulate intrinsic motivation, management should ensure employees feel autonomous in areas such as scheduling work, making decisions, and determining how to do the job. If management wants to enhance introjected motivation, on the other hand, it should make sure employees identify with the tasks performed through job enrichment that ensures one person is responsible for producing a whole product or entire service and has a visible outcome.

With respect to specific HRM practices, we encourage management to take extra care when designing jobs to incorporate external feedback mechanisms. In general, it is important that employees do not have a sense of external pressure or being manipulated because this may have negative effects on the engagement in knowledge sharing. Our data indicated that formal recognition, performance evaluation, and feedback by employees' supervisor may have this negative effect. Management thus needs to take special care when crafting such feedback practices and make sure that employees perceive them as informative and development oriented rather than controlling.

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