

Knowledge sharing in diverse organisations

Jakob Lauring and Jan Selmer, Aarhus School of Business, University of Aarhus
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It has been argued that both strengths and weaknesses of diversity in organisations stem from the different demographic, national, linguistic, social and cultural backgrounds of their members. However, few attempts have been made to link different types of diversity to knowledge sharing despite the fact that organisations which can make full use of their collective knowledge and expertise could be expected to be more efficient, effective and creative. Therefore, a survey was directed towards 16 diverse academic departments in three large universities in Denmark, and 489 academics took part. As predicted, results showed that diversity related to internationalisation (cultural and linguistic) had more positive associations with knowledge sharing than inherent demographic diversity (age and gender), which generally had negative or no relationships with knowledge sharing. The implications of these findings for the management of knowledge in intensive diverse organisations are discussed in detail.

Contact: Professor Jan Selmer, Department of Management, Aarhus School of Business and Social Sciences, Aarhus University, Haslegaardsvej 10, DK-8210 Aarhus V, Denmark. Email: selmer@asb.dk

INTRODUCTION

Human heterogeneity and its impact on different areas of group processes and organisational performance has been the focus of much research over the years. These studies have dealt with multinational enterprise management (Bartlett and Ghoshal, 1989), diversity management (Thomas and Ely, 1996), organisational demography (Martins *et al.*, 2003) or multicultural teams (Earley and Mosakowski, 2000), just to name a few. In general, this line of research argues that both the strengths and weaknesses of diversity in organisations stem from the different demographic, national, linguistic, social and cultural backgrounds of their members (Hambrick *et al.*, 1996).

One area that has recently drawn the particular attention of diversity studies is the creation and sharing of knowledge (Homan *et al.*, 2008). This interest stemmed from a growing number of articles arguing for the benefits in heterogeneous groups with regard to knowledge resources and variation in perspectives (e.g. Michel and Hambrick, 1992; Watson *et al.*, 1993; Maznevski, 1994; Page, 2007). Moreover, knowledge creation and knowledge sharing within organisations seem increasingly to be vital tasks for leading knowledge-intensive organisations (Kogut and Zander, 1992). These processes are argued to lead to better performance because of enhanced cohesion, decision making and coordination (Zarraga and Bonache, 2003). Hence, organisations which can make full use of their collective knowledge and expertise could be expected to be more efficient, effective, and creative (Nonaka, 1994; Srivastava *et al.*, 2006). However, research has repeatedly shown that groups often fail to effectively use their full knowledge potential (Harrison and Klein, 2007; Boone and Hendriks, 2009). As such, diversity in knowledge and perspectives could be a necessary condition but may not always be a sufficient requirement for performance and high-quality decision making (Brodbeck *et al.*, 2007).

While some studies have shown that heterogeneity in human populations may lead to social categories that could pose challenges for interaction and knowledge-sharing behaviour (Tsui

et al., 1992; Orlikowski, 2002), other studies have documented that useful and task-relevant variations in skills and perspectives could also be beneficial to knowledge-sharing behaviour (Watson *et al.*, 1993; Simons *et al.*, 1999; Cummings, 2004; Bell, 2007). Although these arguments could seem contradictory at first, variations in the outcome of diversity may result from different types of diversity having different effects on individuals' interest in locating and sharing knowledge. The same effect has previously been shown in relation to performance (Larson, 2007; Tyran and Gibson, 2008; Mitchell *et al.*, 2009) and group cohesiveness (Tsui *et al.*, 1992; Pelled, 1996; Gonzalez and Denisi, 2009). However, few attempts have yet been made to link different types of diversity to knowledge sharing. This effort is important because not all types of diversity are equally relevant in facilitating knowledge resources in a knowledge-intensive organisational environment (*cf.* Jackson *et al.*, 1995; Pelled *et al.*, 1999; Harrison *et al.*, 2002; van Knippenberg and Schippers, 2007; Williams *et al.*, 2007). Hence, new findings from large-scale studies mapping the relationship between different types of human heterogeneity and knowledge-sharing behaviour could provide valuable guidelines for HR managers working in today's growing number of diverse knowledge-intensive organisations.

Therefore, the purpose of this study is to examine different types of diversity and knowledge sharing. Specifically, we are interested in whether diversity created by increased internationalisation (cultural and linguistic) has a different relationship with knowledge sharing compared with inherent demographic diversity (age and gender). This could provide important results because many organisations face growing demands from globalisation and fear potential negative impacts in relation to knowledge sharing (*cf.* Mäkelä, 2007). We have chosen to focus, on the one hand, on cultural and linguistic diversity because they represent key variations in groups of international staff (Henderson, 2005) and, on the other, on age and gender diversity because they are the most studied inherent demographic diversity variables (Jackson *et al.*, 1991).

The remainder of the article first describes key concepts and the theoretical background. This is succeeded by generation of the hypotheses to be tested. The methods section delineates the target group, the sample and measures applied. Results are displayed and subsequently discussed in terms of main findings, limitations and implications. Finally, the conclusions of this study are drawn.

CONCEPTUALISATIONS

On the one hand, knowledge can be seen as an important organisational resource (Argote and Ingram, 2000). On the other hand, knowledge is linked to other social structures (such as language and culture) that sometimes make it difficult to manage (Zaidman and Brock, 2009). In line with Nonaka (1994), we define knowledge as justified true belief that increases individuals' capacity for effective action in an organisation. Knowledge sharing we understand as the provision or receipt of knowledge in the form of information, know-how and feedback (Cummings, 2004). We use four constructs to assess the identification, acquisition and application of knowledge among organisation members.

Knowledge location refers to the extent to which group members know where internal knowledge resources are located. Groups that generally know where knowledge is distributed among its members have been argued to have better performance (Becker, 2001; Borgatti and Cross, 2003). Knowing expertise location requires information about a variety of potentially useful resources in identifying where to find a direct answer to a question or whom to call on to develop a solution to a more complex problem (Szulanski, 1996; Faraj and Sproull, 2000).

The *knowledge needed* is defined as the information necessary for carrying out the organisation's objectives (Kogut and Zander, 1992). Having available the knowledge resources sufficient to achieve the group's objectives is argued to be crucial for organisational success (Argote *et al.*, 2000).

Knowing that someone else has valuable expertise is important, but it is useful only if one *brings knowledge to bear* (Borgatti and Cross, 2003). To bring knowledge to bear is understood as actualising knowledge resources to a problem or task in a timely manner (Tsoukas, 1996; Argote *et al.*, 2000).

Personal knowledge refers to informal information about non-work issues. This type of knowledge is typically developed in interaction between individuals with a close social connection (Nonaka, 1994; Levin and Cross, 2004). Personal knowledge is information about other organisation members of a personal nature, but like the above described knowledge aspects, it is organisational in nature and not individualised.

Diversity in organisations can be described as variation in different demographic variables. Such variations can be related to deep-level characteristics such as skills and values or to surface-level characteristics such as gender, age, or race. In this article we focus, on the one hand, on diversity related to internationalisation (cultural diversity and linguistic diversity) and, on the other, on inherent demographic diversity (age diversity and gender diversity).

THEORY

There are two theoretical perspectives that could be particularly relevant for understanding the relation between different types of diversity and knowledge sharing, namely Social Categorization Theory (SCT) (Tajfel and Turner, 1986) and the Value in Diversity Perspective (VDP) (Ely and Thomas, 2001).

SCT is closely related to the Similarity-Attraction Hypothesis (Byrne *et al.*, 1966) and to Social Identity Theory (Tajfel, 1982). Consistent with Social Identity Theory, the basic assumption of SCT is that individuals will try to maintain a positive self-perception by being surrounded by similar peers (Goldberg, 2003). Hence, individuals define themselves in terms of group membership that can be based on similarities in demographic characteristics. It is argued that particularly salient attributes can trigger stronger group categorisations. Individuals are thus more likely to differentiate themselves from others based on readily detectable traits (age, gender, race) compared with non-visible characteristics (skills, education, perspective) (Jackson *et al.*, 1991). Moreover, in social categorisation processes individuals come to perceive others not as unique individuals but as examples of a group membership (Phillips *et al.*, 2004). Finally, SCT suggests that an individual's preference for positive social self-evaluation stimulates an unconscious tendency to sort others into social categories that are seen in a more negative light than the in-group (Kulik and Ambrose, 1992; Vora and Kostova, 2007).

SCT predicts that similarity across demographic attributes such as gender and age has a positive effect on group processes such as communication and knowledge sharing that may, in turn, lead to positive work outcomes (van Knippenberg *et al.*, 2004). Diverse groups, on the other hand, will have decreased social attachment and less frequent interaction because of inherent dissimilarities (Tsui *et al.*, 1992; Harrison *et al.*, 2002). With regard to knowledge sharing, SCT would predict that differences in demographic characteristics, and in particular in clearly visible traits, would create fault lines that could function as barriers to interaction (*cf.* Lau and Murnighan, 1998). Put differently, in heterogeneous groups there would be a tendency to form groups based on particular attributes whose boundaries would also function as

boundaries for knowledge sharing. For example, the knowledge of 'who knows what' could be decreased as a result of less frequent interaction in a group (Levin and Cross, 2004; Johnson and Lederer, 2005).

While SCT was mainly developed to explain the effects of readily detected surface-level diversity such as age, gender or race (Chatman and O'Reilly, 2004), the VDP is mainly concerned with deep-level aspects of human differences (Homan *et al.*, 2008). As such, the VDP draws on the premise that there is added value represented by diverse perspectives (Cox, 1994; Ely and Thomas, 2001). This refers to the notion that the inclusion of diverse perspectives can enhance group creativity, decision making and problem solving rendering performance advantages relative to organisations composed of more homogeneous individuals (Triandis *et al.*, 1965; Page, 2007). However, in order to yield benefits associated with diversity, heterogeneous groups must be effectively integrated into work units (van Knippenberg and Schippers, 2007). This entails the removal of barriers that block employees from using their full range of skills (Roberson, 2006). In this process of inclusion it has been argued that dissimilarities that are more meaningful or useful to the common tasks of the group have a tendency to be accepted more willingly compared with differences that are less useful (Webber and Donahue, 2001; Martins *et al.*, 2003). Task-relatedness is therefore theoretically important because it describes whether a type of diversity will increase resources in the form of knowledge and skills that improve the group's abilities to carry out its assignments. As such, it is argued that useful deep-level diversity could be expected to lead to improved group processes (Pelled, 1996; Pelled *et al.*, 1999). For example, because of variation in information, skills and perspectives, there could be more needed knowledge in groups holding task-relevant heterogeneity (Watson *et al.*, 1993; Webber and Donahue, 2001; Page, 2007). Moreover, interaction processes necessary for bringing knowledge to bear could increase if the variation in the group members' skills, information and perspectives is perceived as being task relevant (Simons *et al.*, 1999). This, in turn, could also increase informal, personal knowledge sharing (Granovetter, 1973).

Consequently, diversity in organisations is likely to affect knowledge sharing in different ways depending on the character of the demographic variations. Based on the outlined concepts and theories, we proceed to develop a number of hypotheses for empirical testing.

HYPOTHESES

Diversity related to internationalisation

Cultural diversity is often defined as the existence of a number of different nationalities working together in an organisation (Hambrick *et al.*, 1998) and could be described as a form of deep-level heterogeneity (Jackson *et al.*, 1995). Moreover, cultural diversity may be perceived as a task-relevant diversity in organisations because international members have been drawn to the organisation to use their specific abilities and therefore may offer complimentary information and skills (Hambrick *et al.*, 1998). In other words, intercultural knowledge sharing should be more valuable than knowledge sharing in a more homogenous group because members are more likely to encounter unique knowledge that has not previously been shared. Employees recruited from different parts of the world have different perspectives and possess different knowledge resources. Hence, the usefulness of variation in these kinds of organisations could well foster an environment where more available needed knowledge creates more effective knowledge-sharing behaviour. Consequently, we present the following hypotheses.

Hypothesis 1a: There is a positive relationship between cultural diversity and knowledge location.

Hypothesis 1b: There is a positive relationship between cultural diversity and knowledge needed.

Hypothesis 1c: There is a positive relationship between cultural diversity and bringing knowledge to bear.

Hypothesis 1d: There is a positive relationship between cultural diversity and personal knowledge.

Linguistic diversity is conceptualised as the presence of a multitude of speakers of different national languages in the same work group. It could be related to cultural diversity but may also differ in important aspects. Different language groups may hold relatively similar values (e.g. Swedish- and Finnish-speaking Finns), and national groups may be very different while speaking the same native language (e.g. English speakers in the US and the Philippines). While linguistic diversity has received far less attention compared with other types of diversity, it could still have important implications for knowledge sharing (Marschan-Piekkari *et al.*, 1999; Henderson, 2005; Welch *et al.*, 2005). Faultline Theory (Lau and Murnighan, 1998) would predict that while the existence of two language groups could lead to negative group categorisation, a much larger collection of native languages would force individual organisational members to more regularly use the common organisational language (English) (*cf.* Harzing and Feely, 2008). Hence, the usefulness of English-language skills and the decreased fault lines in multilingual organisations could have a positive effect on interpersonal interaction and knowledge exchange.

Hypothesis 2a: There is a positive relationship between linguistic diversity and knowledge location.

Hypothesis 2b: There is a positive relationship between linguistic diversity and knowledge needed.

Hypothesis 2c: There is a positive relationship between linguistic diversity and bringing knowledge to bear.

Hypothesis 2d: There is a positive relationship between linguistic diversity and personal knowledge.

Inherent demographic diversity

Age diversity is most often described as a surface-level group heterogeneity, understood as overt, biological attributes that are immediately observable, providing strong bases for social categorisation (*cf.* Jackson *et al.*, 1993; Timmerman, 2000). Pelled (1996) suggested that age-group variations should be perceived as a type of diversity that is less related to a group's tasks and therefore less relevant to group functioning and work outcomes. Moreover, observable differences, such as age, are often argued to be associated with negative consequences for group functioning, leading to stereotypes and prejudice, thus hampering cooperation and communication (Milliken and Martins, 1996; Van de Ven *et al.*, 2008). Consequently, age diversity has been argued to have a negative impact on interpersonal interaction and subsequently on the use and availability of knowledge. Hence, we hypothesise:

Hypothesis 3a: There is a negative relationship between age diversity and knowledge location.

Hypothesis 3b: There is a negative relationship between age diversity and knowledge needed.

Hypothesis 3c: There is a negative relationship between age diversity and bringing knowledge to bear.

Hypothesis 3d: There is a negative relationship between age diversity and personal knowledge.

Gender diversity is also commonly regarded as a surface-level heterogeneity (Webber and Donahue, 2001). As such, research in gender diversity has not been consistently able to find complementary differences in skills or knowledge between the two sexes (Kanter, 1988). However, some negative effects of gender dissimilarities could be predicted. For example, as an important visible indicator of dissimilarity, gender is often an essential component of personal and group identity (Bell and Berry, 2007; Tyran and Gibson, 2008). Congruent with SCT, differences among group members in terms of gender could be expected to result in negative stereotyping and decreased interaction (Kramer, 1997; Owen, 2008; Randel and Jaussi, 2008). Hence, gender diversity, much in the same way as age diversity, could not be expected to yield any needed knowledge resources but may well have a negative impact on knowledge-sharing behaviour. This leads to the following hypotheses:

Hypothesis 4a: There is a negative relationship between gender diversity and knowledge location.

Hypothesis 4b: There is a negative relationship between gender diversity and knowledge needed.

Hypothesis 4c: There is a negative relationship between gender diversity and bringing knowledge to bear.

Hypothesis 4d: There is a negative relationship between gender diversity and personal knowledge.

METHOD

Target population and collection of data

Academics of science departments were targeted in this study. A database of email addresses of academics in science departments in three large universities in Denmark was constructed. In total, 16 departments were targeted ranging from traditional disciplines such as chemistry and physics to new specialisations such as nanotechnology and pharmacology.

The data were collected electronically and a commercial web survey software package was used to administer the questionnaire. However, the university affiliation of the investigators was identified as the official sender, and the potential respondents were assured of anonymity and confidentiality as usual. The survey used advanced electronic mail functions that allowed participants to register their responses directly onto the form which then fed a database. A total of 1,022 academics were invited to participate in the survey, and eventually, 489 responses were received, amounting to a response rate of 47.8 per cent.

Sample background

As displayed by Table 1, the majority of the respondents were associate or assistant professors (51.1 per cent) and the respondents had an average period of employment of 7.59 years with their respective department ($SD = 9.19$). Most academics were Danish citizens (62.9 per cent), but a

TABLE 1 *Background of the sample (N = 489)*

Background variables	Frequency ^a	Per cent
Position		
Professor	47	9.6
Associate/assistant professor	250	51.1
PhD student	192	39.3
Gender		
Male	344	71.5
Female	137	28.5
Nationality:		
Non-EU	78	16.7
Non-Denmark EU	93	20.4
Denmark	287	62.9
^a Frequency totals may be less than 489 because of missing values		

substantial minority were foreign nationals (37.1 per cent), where respondents from non-EU countries made up 16.7 per cent and academics from other EU countries than Denmark represented 20.4 per cent of the sample. The number of respondents from each department ranged from 9 to 54, and the share of foreign national respondents from each department ranged from 14.3 per cent (4 of a total number of departmental respondents of 28) to 57.1 per cent (8 of a total of 14). Accordingly, the departments are diverse in terms of the studied variables depicting internationalisation-related diversity. Furthermore, a minority of the science academics were female (28.5 per cent) with a departmental gender diversity ranging from 3 per cent women (machine technology) to 55 per cent women (pharmacology). There were no female professors in either of those two departments, and there were only four female professors in total among the 16 investigated science departments. The average age of the academics was 37.05 years ($SD = 11.34$) with a minimum departmental age range of 17 years (physics and nanotechnology) to a maximum departmental age range of 47 years (physics). Hence, the departments are also diverse in terms of the investigated aspects of inherent demographic diversity.

Instrument

The theoretical concept of group knowledge sharing was represented by the four constructs: knowledge location, knowledge needed, bringing knowledge to bear and personal knowledge. All scales assessing group knowledge sharing used the same seven-point scale with response categories ranging from (1) 'strongly disagree' to (5) 'strongly agree'. The variables depicting the two types of diversity were all factually based, and each of them, except for *gender diversity*, was measured by a single direct question to the respondents.

Group knowledge sharing *Knowledge location* was assessed by a four-item, seven-point scale adapted after Faraj and Sproull (2000). Sample item: 'Department members have a good "map" of each others' talents and skills' ($\alpha = 0.91$).

Knowledge needed was measured by a three-item, seven-point scale adapted after Faraj and Sproull (2000). Sample item: 'Some department members lack certain specialized knowledge that is necessary to do their task' (reverse polarity) ($\alpha = 0.89$).

Bringing knowledge to bear was measured by a four-item, seven-point scale adapted after Faraj and Sproull (2000). A sample item is: 'People in our department share their knowledge and expertise with one another' ($\alpha = 0.80$).

Personal knowledge was measured by a seven-item, seven-point self-developed scale (Appendix) inspired from Faraj and Sproull (2000). Sample item: 'Department members actively seek to exchange information of personal character' ($\alpha = 0.89$).

Diversity related to internationalisation *Cultural diversity* was assessed by the question: 'How many different nationalities are employed among the academic staff?'

Linguistic diversity was assessed by a direct question to the respondents: 'How many languages are spoken on a daily basis in the department?'

Inherent demographic diversity *Age diversity* was measured by the question: 'How old were you on your last birthday?'

Gender diversity was measured using updated information on the departmental homepages available concurrently with the survey data collection regarding the percentage of women among the academic staff of the respective departments.

Control variable *Size of department* was applied as a control variable and measured by a direct question. Controlling for the size of the department seems reasonable because it is not unlikely that in terms of knowledge sharing, large academic departments are different from small university departments (Bettenhausen, 1991).

RESULTS

Sample means, standard deviations and zero-order Pearson correlations of all variables are provided in Table 2. The significant associations between *size of department* and three of the four dependent variables – *knowledge location* ($r = 0.12$; $p < 0.01$), *knowledge needed* ($r = 0.18$, $p < 0.001$), and *bringing knowledge to bear* ($r = 0.25$; $p < 0.001$) – emphasise the need to make use of this variable for control purposes in the regression analysis.

The hypotheses were formally tested by way of hierarchical multiple regression (Table 3). The control variable, *size of department*, was entered in Step 1. There was a significant positive association between *size of department* and *knowledge needed* ($\beta = 0.14$; $p < 0.01$) and *bringing knowledge to bear* ($\beta = 0.20$; $p < 0.001$). In Step 2, the four predictor variables were entered. This produced significant effects on all of the criterion variables, explaining between 5 and 8 per cent of the variance in the variables depicting group knowledge sharing. As displayed by Table 3, concerning the two variables depicting diversity related to internationalisation, there was a positive relationship between *cultural diversity* and *knowledge location* ($\beta = 0.13$; $p < 0.01$), *bringing knowledge to bear* ($\beta = 0.13$; $p < 0.01$) and *personal knowledge* ($\beta = 0.13$; $p < 0.01$). *Linguistic diversity* had a positive relationship with *knowledge location* ($\beta = 0.18$; $p < 0.001$), *knowledge needed* ($\beta = 0.13$; $p < 0.05$), *bringing knowledge to bear* ($\beta = 0.17$; $p < 0.001$) and *personal knowledge* ($\beta = 0.11$; $p < 0.05$). Regarding the two variables portraying inherent demographic diversity, there was no significant association between *age diversity* and any of the variables representing group knowledge sharing. However, *gender diversity* had a negative association with *knowledge location* ($\beta = -0.12$; $p < 0.05$) as well as with *knowledge needed* ($\beta = -0.12$; $p < 0.05$) but had a positive association with *personal knowledge* ($\beta = 0.15$; $p < 0.01$). All *F*-values for the criterion variables were statistically significant, indicating a proper

TABLE 2 Means, standard deviations and correlations among the variables^a

Variables	Mean	SD	1	2	3	4	5	6	7	8	9
1. Knowledge location	4.82	1.18	1.00								
2. Knowledge needed	4.65	1.30	0.38***	1.00							
3. Bring knowledge to bear	5.17	1.11	0.61***	0.41***	1.00						
4. Personal knowledge	4.39	1.02	0.41***	0.18***	0.42***	1.00					
5. Cultural diversity	5.15	1.34	0.17***	0.12**	0.21***	0.13**	1.00				
6. Linguistic diversity	2.82	1.57	0.23***	0.18***	0.25***	0.11*	0.26***	1.00			
7. Age diversity	37.05	11.34	0.03	-0.04	-0.04	-0.07	-0.12*	0.01	1.00		
8. Gender diversity	23.04	1.57	-0.13**	-0.08	-0.03	0.13**	-0.08	-0.08	0.01	1.00	
9. Size of department	76.77	24.56	0.12**	0.18***	0.25***	0.04	0.15***	0.22***	-0.12*	0.14**	1.00

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed).

^a $427 < n < 489$ because of missing answers.

TABLE 3 Results of hierarchical regression for effects of diversity on group knowledge sharing^a

	Group knowledge sharing			
	Knowledge location	Knowledge needed	Bring knowledge to bear	Personal knowledge
	β	β	β	β
Step 1 (control)				
Size of department	0.08	0.14**	0.20***	-0.03
R	0.11	0.17	0.26	0.05
R ² (adjusted)	0.01	0.03	0.06	0.00
F	5.21*	11.76***	29.24**	0.89
Step 2 (diversity)				
Diversity related to internationalisation				
Cultural diversity	0.13**	0.07	0.13**	0.13**
Linguistic diversity	0.18***	0.13*	0.17***	0.11*
Inherent demographic diversity				
Age diversity	0.05	-0.04	-0.03	-0.07
Gender diversity	-0.12*	-0.12*	-0.02	0.15**
R	0.30	0.27	0.35	0.24
Change in R ²	0.08	0.05	0.06	0.06
R ² (adjusted)	0.08	0.06	0.11	0.05
F	8.31***	6.65***	11.52***	5.02***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, two-tailed.
^a Regression coefficients are standardised.

fit between the regression model and the data. Of the presented hypotheses we found support for 1a, 1c, 1d, 2a, 2b, 2c, 2d, 4a and 4b. There was no support of Hypotheses 1b, 3a, 3b, 3c, 3d and 4c. Hypothesis 4d was rejected.

DISCUSSION

Main findings

We found that diversity related to internationalisation had more positive associations with group knowledge sharing than inherent demographic diversity, which generally had negative or no relationships with group knowledge sharing. Of the former two variables, linguistic diversity had positive associations with all of the criterion variables depicting group knowledge sharing, while cultural diversity had positive relationships with three of the four criterion variables. On the other hand, of the variables depicting inherent demographic diversity, age diversity had no association with any of the group knowledge variables, while gender diversity had negative relationships with knowledge location and knowledge needed and a positive association with personal knowledge.

Although very few studies have focused on the effect of different forms of diversity in relation to knowledge sharing, our results are consistent with similar studies focusing on other

group processes. For example, Watson *et al.* (1993) found that over time, culturally diverse groups improved interaction processes and performance more rapidly than the homogeneous groups, resulting in the diverse groups being more effective in identifying problems and generating solutions than the homogeneous groups. Similarly Triandis *et al.* (1965) found that culturally heterogeneous groups were more creative and produced better-quality solutions to problems than culturally homogeneous groups if they both had similar ability levels.

The finding that inherent demographic diversity was negatively related to or unrelated to knowledge-sharing behaviour is also consistent with extant research on different forms of group processes. Jehn *et al.* (1999) found social category demographic diversity (age and gender in combination) to be unrelated to group performance but positively associated with conflict. In accordance with the findings of our study, Jehn *et al.*'s (1999) results indicate that inherent demographic diversity may, at best, be unrelated to group processes that positively promote knowledge sharing.

Our study show different forms of diversity to be positively related, negatively related or unrelated to knowledge-sharing behaviour. This demonstrates the positive as well as the dark sides of diversity. Moreover, while internationalisation seems to have a positive effect on intradepartmental interaction, the results of the study may also be interpreted as reflecting the direction of discriminatory social norms of academic science departments. It may be that academics show acceptance of international colleagues while at the same time being reluctant to collaborate with department members of the other gender.¹ That interpretation is also consistent with the very small number of female professors in the investigated science departments as remarked above. The findings would also be in line with the social comparison theory arguing that career-related demographic similarities (age and to some extent gender) could lead to biased interaction patterns (Festinger, 1954).

Our findings seem consistent with some of the most robust theoretical arguments within diversity studies. They appear to corroborate the VDP with regard to cultural/linguistic heterogeneity as a deep-level type of diversity (Triandis *et al.*, 1965; Watson *et al.*, 1993) and support the social categorisation argument with regard to age/gender heterogeneity as a surface-level type of diversity (Milliken and Martins, 1996; Pelled *et al.*, 1999).

Unexpectedly, we found that gender diversity was positively related to the sharing of personal knowledge. This finding could potentially be related to the fact that personal knowledge is not directly job related. Hence, the different inputs provided by the two genders may be seen as useful in an informal interaction context.

Limitations

As usual, there are a number of potential weaknesses of this investigation that could have biased the findings. Firstly, the department as unit of analysis may pose some limitation because many successful academics could have broad networks of contacts outside the department (*cf.* Lillis and Curry, 2006). With easy availability of the Internet, knowledge needed may not be restricted to one's own department. However, face-to-face interaction is known to be vital in communication and trust building (Levin and Cross, 2004). This is evident by the fact that a very large number of publications are still published by members of the same departments (Harmon-Jones *et al.*, 2009). Furthermore, knowledge sharing within an academic department could be more permanent and continuous because it is based on financial and administrative support as opposed to network contacts which are initiated as the need arises. So, although department-based knowledge sharing may represent a somewhat restrictive view of how contemporary academics share knowledge, it may be the cornerstone that induces and makes other kinds of knowledge sharing possible (Antal and Richebé, 2009).

Secondly, other studies have included variations in educational and functional backgrounds to assess deep-level diversity. In our sample, however, variations within these two variables were too small to yield any useful results. One could also argue that differences in age and gender may indeed lead to experiential diversity. While this is a valid argument, in line with most of the literature in this field (*e.g.* Jackson *et al.*, 1991; Pelled, 1996; Jehn *et al.*, 1999; Pelled *et al.*, 1999), we have argued that experiences acquired through membership of age and gender groups are not as directly related to the work situation of our target group as are cultural or linguistic differences.

Thirdly, the way we measured cultural diversity and linguistic diversity may have been problematic. Assessing cultural diversity by asking how many nationalities are employed among the academic staff may not have captured the essence of that theoretical construct. Although this has long been debated within the literature on cross-cultural studies (*cf.* Hofstede, 1980), nationality may nevertheless be a useful approximation to national culture. Furthermore, asking how many languages are spoken on a daily basis in the department did not take account of the context of language diversity, for example, whether it was in relation to matters of work or non-work.

Last but not least, because the variables, except for gender diversity, were measured at the same time from the same source, common method variance (CMV) cannot be ruled out. However, the presence of CMV does not necessarily affect results or conclusions (Spector, 2006). Furthermore, the cross-sectional research design implies that causality cannot be determined. For better investigative control, a longitudinal design could have been applied, but that might have introduced other methodological problems (*cf.* Menard, 1991).

Implications

Theoretically, our study confirms that different forms of heterogeneity have contrasting effects on group processes and confirms that researchers should be careful in expecting the same effect of all types of diversity. In consequence, this study has extended existing critiques of the main effect of diversity to also include knowledge-sharing behaviour. In other words, some types of diversity may stimulate knowledge sharing in an organisational environment more than others. This finding is important because knowledge as a theoretical concept has taken a considerable role in recent theorising about group diversity (van Knippenberg and Schippers, 2007). For heterogeneous group members to be willing to engage in the challenging processes of knowledge sharing, it seems that they must have complementary skills or relevant information to share. Hence, our findings indicate that usefulness to the tasks at hand moderates the relationships between diversity and group processes such as knowledge sharing. In conclusion, the VDP should not be applied to account for all outcomes of diversity but mainly to explain interaction and outcomes in groups that include complementary tasks relevant to diversity in skills and perspectives. SCT, on the other hand, seems to be useful in understanding team processes in situations where the diversity of the group members does not have a direct constructive application. The more complex relation between diversity and group processes that we have provided here should enhance our understanding of the ways to create, intervene in, and manage groups in heterogeneous knowledge intensive organisations.

Viewed from a practical standpoint, our results provide direction for creating and managing heterogeneous teams to enhance interaction and subsequent performance. There is an indication that group diversity itself is not enough to ensure vital collaboration and knowledge sharing, and that the composition of the group's diversity is critical. Accordingly, there are important practical implications for HR strategies in diverse organisations in general and diverse academic organisations in particular.

HR strategies in heterogeneous knowledge-intensive organisations could be designed to take into account the benefits of certain forms of diversity in the specific context. As diversity related to internationalisation seems to be beneficial to some organisations in particular, HR strategies may be designed and implemented to increase such diversity. For example, international marketing departments would be an obvious place to strategically promote cultural diversity to enhance knowledge sharing. A productive managerial task would be to monitor and design groups' diversity composition. For employees, the engagement in activities through which they assess their own group processes on an ongoing basis could provide understanding of the usefulness of sharing knowledge and at the same time assist to avoid stereotyping.

CONCLUSIONS

This study has examined quantitatively the effect of internationalisation-related diversity and inherent demographic diversity on knowledge-sharing behaviour at the intra-unit level of diverse academic organisations. Thereby, it represents an important attempt to distinguish between effects of deep-level and surface-level diversity in diverse organisations. Accordingly, it contributes to the literature on the management of diverse organisations. Our findings may suggest that the extent of usefulness of the type of heterogeneity within a group affects the knowledge-sharing behaviour of that group. This is generally consistent with the dominating theoretical arguments in the field: the VDP and SCT. This study provides novel information that is useful for HR executives and policy makers to enhance knowledge sharing among their diverse staff congruent with a strategic organisational perspective of internationalisation.

Note

1. This interpretation was proposed by one of the anonymous reviewers.

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APPENDIX

Personal Knowledge (self-developed)

Do department members know each other personally?

1. Department members actively seek to exchange information of personal character.
2. Communication about personal issues is preferably avoided by department members. (R)
3. Department members know fairly well each others' family relations.
4. Non-work related issues are often debated among department members.
5. There is only little exchange of personal information among department members. (R)
6. Department members have a good 'map' of each others' personal interests and hobbies.
7. Department members know where their colleagues live.

R = Reverse scored

- Scale: (1) Strongly disagree
 (2) Disagree
 (3) Somewhat disagree
 (4) Neutral
 (5) Somewhat agree
 (6) Agree
 (7) Strongly agree