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UTHOR'S PROOF

The impact of hierarchical positions on communities of learning

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Abstract Communities of Learning (CoL) are an innovative methodological tool to stimulate 10 knowledge creation and diffusion within organizations. However, past research has largely 11 overlooked how participants' hierarchical positions influence their behavior within CoL. We 12 address this shortcoming and provide empirical evidence on 25 CoL for a global training 13program, analyzing user statistics from 249 staff members. Our results indicate that partici-14 pants' level of activity and performance are significantly influenced by their hierarchical 15position. We also discover a duality among participants holding low hierarchical positions. 16The implications of these results and future research avenues are discussed. 17

Keywords Communities of learning · Content analysis · Hierarchical positions · Learning in organizations

Introduction

Numerous researchers have highlighted the importance of training and development as a 22pivotal aspect in contributing to the competitive advantage of organizations (e.g. Argote and 23Ingram 2000; Nonaka 1994). In today's turbulent economic environment, employers and 24employees constantly need to update their knowledge and skills in order to face new 25challenges (Chalmers and Keown 2006). As a result, many organizations have dedicated 26sizable resources to facilitate the training and development of their staff (Kane and Alavi 272007). The most prominent delivery method among these activities, with more than 60 percent 28of organizations implementing it, has been instructor-led classrooms (Armstrong and Sadler-29

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Smith 2008). This method has been acknowledged to be well suited for laying the groundwork 30 for more advanced learning (Soden and Halliday 2000), and for providing a comprehensive 31background to continue with more refined and practically oriented training (Robey et al. 2000). 32 Yet, scholars have criticized this delivery method for offering knowledge that is neutral to 33 circumstances and only has limited applicability in real-life working environments (Eraut 34 2000). With organizations facing pressure towards the pursuit of more cost-effective and 35innovative learning methods, practitioners and researchers alike have started looking for new 36 approaches to enhance the impact of training and development (Yamnill and McLean 2001). 37

A common characteristic of such new approaches is the notion that learning is an interactive 38 process, where knowledge is being created while collaborating in social networks composed of 39diverse groups of people (Hakkarainen et al. 2004). In this context, online Communities of 40Learning (CoLs), which are groups of people "engaging in collaborative learning and 41 reflective practice involved in transformative learning" (Paloff & Pratt, 2003, p. 17), have 42 02 gained an increasing amount of attention (Stacey, Smith, and Barty 2004). CoLs foster online 43 collaborative learning (Brower 2003), by providing participants with the opportunity to 44 collaboratively learn irrespective of time and place (Gunawardena et al. 1997). Here, we 45define online learning as the use of technical media, e.g. asynchronous discussion forums, and 46a quasi-permanent separation of educational staff and participants throughout a training 47activity (Keegan 1980). Previous research has stipulated that these types of CSCL environ-48ments foster "learning due to the explicitation of individual knowledge elements [...] and the 49consecutive reorganization of knowledge elements in the course of social transactions." (De 50Wever, et al. 2006, p. 7). 51

Considering the implementation of such initiatives, previous studies have revealed that this 52can be an intricate endeavor. Research focusing on institutes of higher education, where similar 53approaches are increasingly part of regular educational activities, has indicated that online 54training is more complex and demanding for learners than participating in a face-to-face 55environment (e.g., Arbaugh and Benbunan-Finch 2006; Järvelä et al. 2008). More specifically, 56research has shown that individuals react differently to online learning. Depending on their 57background and motivation, participation in CoLs may differ. For example, Caspi and 58colleagues (2006) found empirical evidence that students' personality traits, e.g., whether 59someone is extrovert or neurotic, have an impact on how participants engage in online 60 collaborative activities. Other studies have shown that performance levels are affected by 61 participants' academic motivation levels (Rienties et al. 2009). 62

Similarly, stimulating employees with diverse backgrounds to learn collaboratively also 63 bears risks. The impact of diversity on organizations has been the subject of many 64studies, covering its effect on general group dynamics (van der Vegt et al. 2006), 65performance (Webber and Donahue 2001), as well as learning activities (Foldy et al. 66 2009). And although potential benefits have been identified (Bunderson and Sutcliffe 67 2002), empirical studies have provided mixed results (e.g., Jehn et al. 1999; Simons et al. 68 1999), suggesting that diversity, defined as the distribution of individuals across one or 69 more attributes, is a "double-edged sword" (Milliken and Martins 1996, p. 403). 7071Bunderson and Sutcliffe (2002) found highly significant and positive effects of differences 72in individuals' functional backgrounds on their information sharing behavior. In contrast, empirical work by Jehn (1995) shows that differences in members' personality traits can 73cause varying degrees of anxiety among team members, making them feel uncomfortable 74in communicating with their colleagues and thereby inhibiting their cognitive functioning 75in processing new information. Therefore, specific attention needs to be paid to the 76underlying mechanisms of interpersonal processes that can influence, and have an impact 77 on, learning (Foldy et al. 2009). 78

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The purpose of our study is to contribute to the discussion of how participants' diversity can 79influence training processes within organizations. We focus on a specific source of diversity 80 that can have a considerable impact on collaborative learning processes, namely the hierar-81 chical position of individuals (e.g., Bunderson 2003b; Krackhardt 1990; Romme 1996). 82 Additionally, while previous research has largely focused on regular working environments 83 (e.g., Jehn and Bezrukova 2004), the present study will provide empirical evidence from a 84 global organizational training program, where 249 participants from three hierarchical posi-85 tions (within the same organization) collaboratively enhanced their knowledge and skills via 86 dedicated online CoLs. The results of this analysis will provide important insights on patterns 87 of communication (Cramton and Hinds 2005) that will help HRD managers to better anticipate 88 participant behavior and devise training activities that stimulate participants to actively engage 89 (Foldy et al. 2009). 90

Communities of learning

Online asynchronous communication can overcome barriers of time and place, while allowing 92participants to share experiences and create new ideas that can help to improve the business 93 process (Leonard and Sensiper 1998). In this context, CoLs have emerged as a promising 94methodology used by organizations to foster the effective exchange of knowledge and 95experience among members of their workforce (Stacey et al. 2004). This process is positively 96 affected by individuals being able to collaboratively enhance their knowledge and skills across 97 intra-organizational boundaries, such as business units or job positions. This allows organiza-98 tions to create a *hothouse* for new ideas and thoughts (Schlager et al. 2002). Similarly, 99 connecting employees with different background characteristics can create a fruitful atmo-100sphere for them to share their experiences, while acquiring various job-related skills and 101 effectively processing new information (Jehn and Bezrukova 2004). As a result, the capacity 102of individual employees can be enhanced, as well as the process of knowledge creation within 103an entire organization. 104

CoLs are rooted in the concept of Communities of Practice (CoP). Conceptualized by Lave 105and Wenger (1991), CoP constitute "groups of people who share a concern, set of problems or 106passion about a topic and who deepen their knowledge and expertise in this area by 107interacting on an ongoing basis" (Wenger et al. 2002, p. 4). However, researchers have argued 108that CoLs provide a better fit with training in organizations (Nachmias et al. 2000), as they 109have a clear learning connotation and exhibit a higher degree of structure and formality (Zhang 110et al. 2010). Moreover, we consider CoLs to be comprised of small *team-like* groups. In 111 contrast, researchers often consider CoP to be *teams* (Schlager et al. 2002). This distinction is 112of great importance, as teams are generally defined as "a collection of individuals who are 113interdependent in their tasks, who share responsibility for outcomes, who see themselves and 114who are seen by others as an intact social entity embedded in one or more larger social 115systems" (Cohen and Bailey 1997, p. 241). However, while participants in CoLs can learn and 116benefit from the insights and experiences of their colleagues, they remain responsible for their 117own learning outcomes. In contrast CoP are responsible for learning as group, team or 118 community. 119

Generally, past research on online communities was often concerned with how to create 120 interactive online learning environments (Roblyer and Wiencke 2003), the impact of group 121 size on online learning (Vrasidas and Zembylas 2003), or the technological tools being used 122 (Alavi et al. 1997). However, work by, among others, De Laat and Lally (2003) has shown that 123 the social and contextual framework in which the learning takes place has a considerable 124 influence on how participants behave and perform. Additionally, previous studies, mainly 125

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being conducted with participants from institutes of higher education, have also shown that 126participants react differently to online learning. While some participants actively join online 127discussions, others have a tendency to withdraw and become passive observers (Caspi et al. 1282003). Additionally, while some participants are triggered to achieve high performance levels, 129others show signs of "underperformance" (Rienties et al. 2009). This has become an issue of 130concern, especially since a significant positive relationship between the level of discourse and 131the achievement of participants has been identified (Cohen 1994). Similarly, work by Caspi 132and his colleagues (2006), questioning 646 participants in a course on "Research Methods" at 133the Open University of Israel, indicates interaction as a decisive factor in determining whether 134training is successful in enhancing the knowledge and skills of participants. Consequently, new 135insights are required on what factors influence online-learning processes (Sambrook 2005) and 136how differences in participants' background characteristics affect their collaborative behavior 137 (Zack and McKenney 1995). 138

Impact of hierarchical positions on learning

The creation of diverse groups of employees for training purposes has become a common-140place phenomenon within organizations (Thomas-Hunt et al. 2003). The underlying intention 141is to create a broader pool of non-overlapping knowledge that stimulates participants to share 142information. This, in turn, can enhance employees' capacity and skills, and contribute to the 143overall performance of an organization (Bunderson and Sutcliffe 2002). Yet, participants can 144feel intimidated when communicating with colleagues from different backgrounds (Jehn 1451995). Hence, researchers suggested that the organizational context can be the "800-pound 146gorilla" (Salas and Kozlowski 2009, p. 468) that influences how staff members behave and 147 perform during training. In this respect, business thinkers like Gary Hamel have stressed that 148 an organization's hierarchical structure influences the way people communicate with each 149other (Hamel and Green 2007). Taking into account these stipulations, Fig. 1 provides a 150conceptual overview of the underlying variables that have been used to analyze the research 151hypotheses of the current study, and which will be introduced below. 152

Previous research on hierarchical positions has been greatly influenced by the concept of 153 status value creation, which according to Berger and Fişek (2006) is a key mechanism for a 154



Fig. 1 Conceptual overview of research hypotheses

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"group's interaction hierarchy" (p. 1041). Similarly, Ridgeway and Correll (2006) stipulate 155that "if people from one category are structurally advantaged in some way (i.e., by material 156resources or technology)" (p. 435) this will reinforce already developed status beliefs. While 157these considerations have provided valuable insights to the discourse on the topic, we depart 158from the work of, among others, Bunderson and Sutcliffe (2002). These authors introduced the 159term functional diversity, which they define as "the distribution of [group] members across a 160range of relevant functional categories" (p. 875). Moreover, and building upon this notion, we 161 consider hierarchical positions to resemble what Bunderson and Sutcliffe have termed func-162tional assignment diversity, which is determined "on the basis of job title and/or responsibil-163*ities*" (p. 879). In later work by Bunderson (2003b), this type of formal authority had an 164important potential impact on how individuals engage into discussions within groups. 165

Similarly, depending on their hierarchical position, participants will generally display 166varying levels of activity within collaborative learning processes (Bird 1994). Analyzing 167the electronic mail community of a Fortune 500 office equipment firm, Sproull and 168Kiesler (1986) discovered a "status equalization" process (p. 1507). They attribute this 169result to the reduced amount of social context cues in asynchronous communication. 170Without direct exposure to their supervisor during discussions, employees might feel more 171comfortable in sharing information. Weisband and colleagues (1995) also argue that 172computer-mediated communication should lead to a "deindividuation" (p. 1125) that 173weakens social norms and reduces social inhibitions. However, based on three 174experiments with 269 M.B.A. students, Weisband and colleagues (1995) revealed that 175higher level participants were more active in discussions than their lower level colleagues. 176Additionally, based on qualitative data from on-going workgroups, and focusing on the 177 level of participation within learning teams, Sutton and colleagues (2000) also suggest a 178positive relationship between the hierarchical position of participants and their level of 179activity. Hence, members from lower hierarchical positions will mainly follow discussions 180and rarely interject. This behavior is triggered by a propensity to integrate into the group. 181 On the contrary, representatives from higher up in an organization's hierarchy tend to 182replicate their normal behavior and also lead to virtual teams. This mode of behavior is 183suggested to stem from a drive to dominate discussions, in order to reinforce the 184prevailing status quo (Yates and Orlikowski 1992). Other research has suggested that 185lower management is subject to a certain "fear of speaking up and making mistakes in 186the group" (Edmondson 2002, p. 139), leading them to underestimate their contributions 187 and to exhibit more passive behavior during discussions (Nembhard and Edmondson 1882006). Yet, previous studies on this topic can be said to exhibit three main shortcomings. 189First, previous research has largely been conducted in a laboratory or classroom setting, 190thereby neglecting the organizational context (e.g., Schippers et al. 2003). While this 191provides a solid foundation for understanding general principles and underlying mecha-192nisms, as well as how participants behave and perform within institutes of (higher) 193education, it only provides limited insights on how such a scenario would look like in 194an actual organization. Second, past studies on diverse groups in organizations have 195196largely focused on work-related activities in regular face-to-face environments (e.g., 197 Berger et al. 1998). The criticism here is that work-related activities are predominantly connected to performance measures that act as a direct mechanism to allocate rewards 198(Berger et al. 1998). In contrast, while participating in a training program can enhance 199individuals' chances to perform better in the future, the nature and level of a potential 200201 direct effect remains to be debated (e.g., Kirwan and Birchall 2006). Consequently, taking into account these considerations and addressing the mentioned shortcomings, our first 202research hypothesis is: 203 H1Participants' level of activity within CoLs is positively related to their hierarchical
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In addition to the dimension of activity within collaborative (learning) processes, 206previous studies have also considered the potential impact of hierarchical positions on 207performance. However, the focus of these studies has generally been on teams and 208considered performance at the organizational level, for example in terms of profitability 209or sales (Simons et al. 1999), at the team level (Bunderson 2003a), or as a mechanism to 210allocate rewards within a team (Berger et al. 1998). However, while participants can 211 benefit from the insights and experiences from their colleagues within CoLs, their overall 212level of interdependence remains limited and their performance is largely assessed based 213on their individual efforts and output. Yet, to the best of our knowledge, there are no 214 studies on small *team-like* groups within the context of organizational training. 215Consequently, we decided to draw upon the work from team research, as this can provide 216valuable insights on how performance levels can generally be affected by hierarchal 217positions. More specifically, Bunderson (2003b), using survey data from 45 business unit 218management teams in a *Fortune* 100 consumer products company, stipulates that senior 219managers are accustomed to integrating information from different functional areas and 220disciplines. Similarly, Arts and colleagues (2006), based on a study of 115 subjects, 221ranging from undergraduates to senior managers with over 25 years of work experience, 222show that individuals, who have been working for more than 12 years, are driven by their 223experiences and are better able to effectively infer new information. Moreover, compared 224225to their more junior colleagues, they are less likely to make mistakes and provide more accurate solutions to new problems. Based on these findings, and taking into account 226previous research that has established work experience as a significant predictor for the 227hierarchical position of an individual (Tachibanaki 1988), we transfer the analogy into 228the case at hand. Hence, when participants' performance is assessed on how well they 229can integrate new knowledge in their own working environments, our second research 230hypothesis is: 231

H2 Participants' level of performance within CoLs is positively related to their hierarchical 232 position. 233

Method

Setting

The present study collected data from an online training program, whose aim was to enhance 236the capacity and skills of a global organization's staff in daily work. The training program was 237delivered twice during a 6-month time frame and specifically focused on five pre-defined 238content modules. These modules covered different aspects of Economics (e.g., 239Microeconomics and International Trade). The program was built on a blended learning 240approach. The first part, on which our study focused, took place entirely online over the span 241of 14 weeks, with no scheduled synchronous meetings. Upon successful completion, partic-242ipants could attain a certificate of participation, together with academic credits that were based 243on the European Credit Transfer and Accumulation System (ECTS). 244

Participants engaged in two types of learning activities. First, using (multimedia) learning 245 materials, such as web lectures and online quizzes, participants conducted self-study. Second, 246 and constituting the backbone of the online part, participants collaboratively discussed real-life 247

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tasks via asynchronous discussion forums. The forums were situated in dedicated CoLs, each 248consisting of 7–13 participants. Each content module had a separate task and discussion forum. 249The tasks were based on real-life situations and cases that stimulated participants to draw on 250their prior knowledge and experience, while striking a link between theory and practice. 251Furthermore, a number of "guiding questions" were included to provide a certain level of 252direction and to stimulate participants to actively engage into discussions with their colleagues. 253Participation in these forums was obligatory and taken into account for determining partici-254pants' eligibility for receiving their certificate of participation. The latter was accomplished by 255assigning two academic staff members to each CoL. They were responsible for grading 256participants' contributions, moderating discussions, and providing help in case of technical 257difficulties. The facilitators were trained in working with online discussion groups and 258received elaborate guidelines and answers keys for all training activities. Additionally, during 259regular meetings facilitators could discuss their experiences and streamline their behaviour and 260actions towards participants. 261

In addition to the obligatory, content-driven discussion forums, each CoL also had its own 262"Café-Talk" forum, where participants could socialize and exchange private information (Nonaka 2631994). More specifically, at the beginning of the training program, participants were encouraged 264to share a short, personal introduction within their applicable "Cafe-Talk", including information 265on their personal (e.g., family), as well as professional background (office, region, job responsi-266bilities). These voluntary introductions provided the only opportunity for participants to get to 267know each others' hierarchical position. Unless they provided this information themselves, their 268fellow CoL members had no way of knowing this particular detail. At the end of the online part, 269participants had to complete a final exam and received a final grade. A more detailed description 270of the grading procedure will be provided in the next section. 271

Participants

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Staff members had to be nominated by their supervisors to be eligible to participate. Overall, 273274337 participants were randomly assigned to 30 CoLs. Additionally, in order to maximize the amount of diversity within the individual CoL, thereby ensuring that participants could benefit 275from the insights and experiences of colleagues from a wide range of other offices and regions, a 276dedicated filter was employed. This filter controlled for the variability among participants. The 277present study analyzes a subset of 25 CoLs and 249 participants (73.88 %). On the one hand, 278this was due to exclusion of incomplete datasets from some participants. On the other hand, 5 279CoLs had to be excluded as they were biased and did not include participants from all applicable 280hierarchical positions. The 25 CoLs had an average of 9.96 members (SD=1.72, range=7-13). 281The average age was 43.92 (SD=7.33, range=27–58) and 54.61 % of the participants were 282female. Overall, 79 nationalities and 8 operational regions, in which the organization is 283conducting business, were represented. The participants' educational backgrounds included 284Master's (71.37 %), PhD's (14.51 %), Bachelor's (7.26 %) and other degrees (6.85 %). The 285underlying disciplines of the latter included, Health Sciences and International Law. 286

Instruments

Data on participants' hierarchical position

Participants reported their own hierarchical position via the training's official registration form. 289 The indicated options were subject to the organization's official job categories. Based on the 290

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target group of the training program, three main categories were identified, namely "Low"-, 291"Middle"- and "High"-level hierarchical positions. Generally, representatives of the "Low" 292group were associated with project level work, contributing to sub-parts of the overall product. 293Members of the "Middle" group were leaders of such projects. Finally, participants from the 294"High" group were responsible for departments and often entire regions in which the 295organization was operating. With respect to the amount of participants from the different 296hierarchical positions, 82 participants held low hierarchical positions (32.93 %), compared to 29793 (37.35 %) and 74 (29.71 %) for middle and high hierarchical positions respectively. 298

The level of activity

In accordance with previous research, we defined the overall level of activity as the quanti-300 tative contributions within discussion forums, measured by the amount of individual partici-301 pant's contributions (Strijbos et al. 2006). Here, threads refer to amount of messages sent (e.g., 302 Harasim 1993), including new contributions to the discussion, as well as replies to already 303 existing posts. By analyzing these types of user statistics from the discussion forums, this 304approach provided valuable insights into the interaction patterns, without interrupting the 305 actual learning process (Zembylas and Vrasidas 2007). Furthermore, in order to gather more 306 detailed insights on the type of activities participants engaged in within CoLs, we further 307 distinguished between threads that were posted in the "Cafe-Talk" (social) or the content-308 driven discussion forums. 309

The level of performance

In order to assess participants' performance within CoLs, we employed a two-tier approach. At 311 base-level, we followed the work of Cho and colleagues (2007), who investigated performance 312levels of graduate students in online learning communities, and estimated performance levels 313 by participants' grade for an open-question type final exam. The exam was based on the topics 314discussed in the forums and constituted 50 % of the final grade. The remaining 50 % were 315based on participants' contributions within the discussion forums. For the purpose of this study 316we focused on the final exam grade, as this was solely based on the quality of participants' 317 answers. In contrast, the participation grade also incorporated elements such as the quantity of 318posts, which provides only limited insight on the quality of participants' posts. Both grades 319were determined by the academic staff facilitating the CoLs and administered on a scale from 1 320 (very poor) to 10 (very good). The minimum requirement to pass was 5.5. The general 321guideline for the grading procedure was to assign higher grades for more complex contribu-322tions. Hence, if participants were able to replicate knowledge, for example citing definitions of 323 key terms, they received comparatively low grades. In contrast, when participants showed that 324 they were capable of interpreting new information and applying it to their own working 325environments, they received higher grades. This approach is well suited to attain a first 326 impression of the underlying situation. However, it has been suggested to suffer from more 327 328 performance irrelevant variance than objective measures, caused by rater-bias (DeChurch and Mesmer-Magnus 2010). Additionally, it does not allow for more refined conclusions on what 329really has been discussed within the forums. Consequently, we also conducted a content 330 analysis of the discussion forums. 331

In the context of this study, we chose a coding procedure, which was first developed by 332 Veerman and Veldhuis-Diermanse (2001) and then subsequently validated and extended by 333 Schellens and Valcke (2005). The instrument distinguishes between *non-task related* and *task* 334 *related* contributions. While non-task related contributions are considered as social and 335

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informal in nature, task related messages capture the cognitive level of participants' contribu-336 tions. Consequently, as we investigated participants' performance levels, we focused on the 337 task related category of the underlying coding scheme. The task contributions are comprised of 338 five sub-categories, namely New Facts (e.g., reference to data findings), Own Experience & 339 Opinions (e.g., sharing professional experience on the topic), New Theoretical Ideas (e.g., 340definitions of domain-specific terms and methodologies), Explicitation (e.g., refining informa-341 tion shared before) and *Evaluation* (e.g., combining and critically discussing previous contri-342 butions). Within these types of contributions, increasing cognitive levels are assigned to 343 participants' messages. More specifically, New Fact represents the lowest and Evaluation 344 the highest attainable cognitive level that participants can achieve. According to de Wever and 345 colleagues (2006) this approach is well suited to gain an overview of the general cognitive 346 processes that take place within learning communities. Table 1 below provides exemplary 347 sentences that highlight how these considerations took shape in the forums. 348

Previous studies have generally based their coding procedure on either each individual 349 sentence, a unit of meaning within a message, or complete messages (de Wever et al. 2006). 350 For this study, we chose to implement the unit of meaning approach, as this technique 351addresses the limitations of fixed syntactical units, such as a sentence, or a complete message, 352which run the risk of ignoring meaningful aspects of a communicative construct (Rourke et al. 353 2000). Furthermore, the unit of meaning approach accounts for the possibility that a single 354message can contain more than one theme or idea (de Wever et al. 2006). Finally, this method 355has been recommended by researchers like Gunawardena and colleagues (1997) as an 356 appropriate tool for evaluating the quality of learning in online discussion groups. 357

All contributions within the discussion forums were assessed by two independent coders. 358The coders were trained on the basis of two test cases, consisting of 67 and 74 messages 359respectively, that were randomly selected from CoLs that were not included in the final coding 360 procedure. After the first coding exercise, the Cronbach alpha (α) and Cohen's kappa (κ) were 361 0.68 and 0.45 (p < 0.01) respectively. Considering the generally established absolute minimum 362 threshold for these two measures, namely 0.7 for Cronbach alpha (Cortina 1993) and 0.4 for 363 Cohen's kappa (Banerjee et al. 1999), this constituted an unsatisfactory amount of inter-rate 364reliability. Consequently, both coders were invited to discuss discrepancies in their coding, 365which is inherently part of these subjective procedures (De Laat and Lally 2003). The results of 366

Type of communication	Category	Example
Task related	New facts	but for sure in a rural setting (subjects) [] have more tendency to be absent as they are also difficult to be monitored by the loca community members.
	Own experience & opinions	I work in a country where (topic of discussion) is in full swing. Of (concepts), [Concept 1] specifically addresses [topic] using targets indicators.
	New theoretical fact	[] economic theory states that trade liberalization boosts economi growth and social welfare.
	Explicitation	Just to add that beneficiary control is usually efficient to the degree of economic power, status, education and confidence of the beneficiaries
	Evaluation	The reflection comes to me after the study of the paper is very simplified the incentives can be different and attractive to settling the weakness the system and it may be sustained only if the economy [].

1.1 T a	able 1	Exemplary	sentences	of task	related	communication	in	discussion	forums
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the second test case were then α =0.93 and κ =0.65 (p<0.01). Based on this confirmatory 367 result, the actual coding procedure was then initiated. The inter-rater reliability then was α = 368 0.92, and κ =0.73 (p<0.01), which indicated very good agreement beyond chance (e.g., 369 Banerjee et al. 1999; de Wever et al. 2006). 370

Data analysis & procedure

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The main data analysis was based on individual levels. However, participants were nested 372 within different CoLs. Depending on their specific composition, with respect to participants' 373 hierarchical positions, this could have led to different dynamics and results. As a result, it 374would not have been possible to compare results across CoLs. Hence, in order to account for 375 possible differences across CoLs with respect to hierarchical positions, we used the Shannon 376 Equitability Index (Magurran 1988). The average score of equitability index for the investi-377 gated 25 CoLs was 0.44 (SD=0.05, range=0.35–0.55). Additionally, the intra-class correlation 378 coefficient (ICC), which represents the proportion of the total variability in the outcome that is 379 attributable to the CoLs (e.g., Cress 2008), amounted to -0.052. Taking together these two 380 measures, we therefore concluded that the CoLs provided representative and comparable 381 samples. 382

In order to test for our research hypotheses we employed two different approaches. 383 First, hypothesis testing was used to investigate the validity of the research statements 384H1 and H2. Testing for the normality of the data's distribution revealed a violation of 385 the parametric assumption for all measured variables. Consequently, we used 386 Spearman's rho (r_s) to determine correlations; Kruskal-Wallis tests (H) to assess 387 differences between groups; and Jonckheere-Terpstra tests (J-T) to identify any possi-388 ble linear trends. The occurrence of possible patterns underlying the H-test results was 389 determined by post-hoc Mann-Whitney (U) tests. Being designed to only measure 390 differences between two independent conditions, the U-test results were corrected by 391the Bonferroni method. As a result, our adjusted critical value of significance was 392 0.016 for this part of the analysis. Furthermore, we also estimated the effect size of 393 our findings. However, the vast majority of effect size measures are only suitable for 394parametric data (Snyder and Lawson 1993). Consequently, we followed the suggestion 395of Rosenthal (1991) and approximated the effect size (r) on the basis of the U-results. 396 This measure takes on values from 0 to 1, where small, medium and large effects are 397 associated with 0.10, 0.30 and 0.50, respectively (Cohen 1992). Finally, and following 398 the suggestions of Cress (2008), we accounted for the "common fate", as well as 399 "reciprocal influence" argument (pp. 72-73). Common fate refers to the fact that 400participants are subject to unique utterances within their CoL. Consequently, while the 401 outputs of the discussions can be similar, the process can be experienced by individ-402uals quite differently between CoLs. Reciprocal influence describes the observation 403that participants' behavior in discussion forums can be significantly influenced by 404 their colleagues within the same CoL. Consequently, in order to account for our 405nested data, we also used multilevel linear regression modelling to determine how 406hierarchal positions might have affected individuals' behavior within a CoL. 407

Second, and taking into account that the underlying data consists of a mixture of categorical 408 and continuous variables, we used two-step cluster analysis (Banfield and Raftery 1993). The 409 underlying reason was to investigate patterns in the available data set that might have been 410 overlooked by the previous method. By segmenting the data into homogenous subgroups of 411 cases, the two-step cluster analysis could either provide further supportive evidence for the claim that hierarchical positions are an important factor in CoLs, or highlight additional 413

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relationships that need to be taken into account for future studies. The optimal amount of 414 clusters was based on the Schwarz's Bayesian criterion (BIC) and log-likelihood was used as 415 the distance measure. 416

All applicable calculations were conducted using either SPSS 20, or the statistical computing software R 3.0.0 (packages "Rcmdr", "ggm", "nlme", and "ICC"). 418

Control measures

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We acknowledge that hierarchical positions constitute one very specific source of diversity that420can influence how individuals participate and perform within a CoL. Consequently, in order to421be able to make the appropriate inferences about the findings of our study, we controlled for a422range of characteristics that have been suggested by previous research as influencing factors on423online collaborative learning. These characteristics include *educational background*, *prior*424*knowledge* and *age*. In this study, participants' educational background and age were self-425veported as part of the training programs' official registration form.426

Educational Background For educational background, participants were asked to indicate 427 their highest attained educational degree, including Bachelor, Master, PhD and Other (e.g., 428vocational training). Previous studies have indicated that differences in these aspects can 429increase the likelihood of groups being able to draw on more diverse sets of insights and 430experiences (Jehn et al. 1999). As a result, individuals will be stimulated to engage into 431 discussions with their colleagues. Additionally, the potential impact of participants' prior 432 knowledge on their behavior and performance within learning initiatives has been highlighted 433by authors like Dochy and McDowell (1997). 434

Prior knowledge was measured via a diagnostic test, consisting of 25 multiple choice ques-435tions. All five pre-defined content modules were assessed based on five dedicated questions 436each. These questions were created by academic experts and related to the working environ-437 ment of the participants. The response rate for the questionnaire was 88.76 %. There was a 438growing consensus that individuals' prior knowledge constitutes an important variable in 439learning activities, including participants' activity and performance patterns (Dochy et al. 440 1999). If a participant already possesses a considerable amount of prior knowledge about a 441 certain topic, it can be expected that she will be more comfortable in contributing to 442discussions and dealing with the content matter, thereby positively influencing her general 443 activity and performance levels. 444

Age With respect to age, Garavan and colleagues (2010) found that older employees 445tend to participate less in online training activities. Additionally, (Pelled et al. 1999) 446 stipulated, and were able to empirically show, that age similarity had the potential to 447 trigger emotional conflicts within groups, resulting in lower participation rates. 448 Regarding gender, Im and Lee (2004) suggested that if females felt intimidated by 449males in a regular face-to-face environment, this was also likely to carry over to an 450online environment. In contrast, some studies were able to show that online training 451environments were able to eliminate this tendency (Joinson 2001). However, research 452by Wolfe (1999) showed that women engaged into less discourse in online collabo-453rative training, compared to their male colleagues. To account for the three control 454measures, we conducted a third-order partial correlation. Additionally, in order to 455simultaneously model our three control measures in combination with our main effect, 456we also included the variables in our multilevel linear regression modelling. 458

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Results

Hypothesis testing

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The correlation analysis revealed a distinctive positive relationship between participants' 461 hierarchical position and their level of activity, as measured by their total amount of contribu-462tions ($r_s=0.18$, p<0.01). Moreover, this relationship was clearly driven by the amount of 463 contributions in the content-driven forums ($r_s=0.18, p<0.01$). The result of the Kruskal-Wallis 464 test provided further evidence that participants' hierarchical position had a significant impact 465on their level of activity. As can be seen in Table 2, this difference can again be solely 466 attributed to the activity in the content-driven forums. Additionally, a Jonckheere-Terpstra test 467 validated the positive relationship between hierarchical position and the level of activity. In 468 follow-up to these findings, and now focusing on the content-driven forums, the results of the 469Mann–Whitney tests showed that the difference in contributions was especially pronounced 470 between "Low" and "High" (U=2279.00, p=0.01), as well as "Low" and "Middle" (U= 471 2941.50, p=0.01). In contrast, the comparison of "*Middle*" and "*High*" (U=3317.00, p=0.69) 472yielded no significant result. 473

We therefore stipulated that there is a positive and significant relationship between the 474hierarchical position of a participant and their level of activity within a CoL. However, this did 475not yet provide any indication about the actual strength of this relationship. Consequently, we 476also calculated the applicable effect sizes. The results showed again that the impact of 477 hierarchical positions on participants' levels of activity was most pronounced between 478"Low" and "High", where we find reasonable effect sizes for total amount of contributions 479(r=-0.22). Overall, we therefore accepted our first research hypothesis (H1), that the higher 480the hierarchical position of a participant, the higher their level of activity will be within a CoL. 481

The second research hypothesis (H2) focused on the impact of hierarchical positions on 482 participants' performance levels. Using a similar approach as for hypothesis one, we first 483conducted a correlation analysis. The results clearly indicated a significant and positive 484 relationship between hierarchical position and final exam grade ($r_s=0.17, p<0.05$), overall 485task related communication ($r_s=0.17, p<0.01$), New Facts ($r_s=0.18, p<0.01$), and Evaluation 486($r_s=0.18$, p<0.01). In determining whether differences in the scores were significant, a 487 Kruskal-Wallis test yielded significant results for the final exam, overall task related commu-488 nication, New Facts and Evaluation. Moreover, as can be seen in Table 3, the underlying trend 489of the main effect clearly suggested a positive relationship between hierarchical position and 490the indicated measures of performance. In order to determine the component parts of the main 491effect, another range of Mann-Whitney tests was conducted. Here, we again found significant 492differences in the aforementioned variables, especially when comparing "Low" and "Middle", 493

	Kruskal-Wal	lis	Jonckheere-Terpstra		
	χ^2	df	# of Levels	Ν	J-T
Total contributions	9.41**	2	3	249	2.84**
Café-Talk forums	1.30	2	3	249	0.32
Content-driven forums	9.35**	2	3	249	2.91**

Table 2 Results of Kruskal-Wallis and Jonckheere-Terpstra tests for activity measures

* p<0.05, ** p<0.01

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	Kruskal-Wallis		Jonckheere-Ter	pstra	
	χ^2	df	# of Levels	Ν	J-T
Final Exam Grade	7.64*	2	3	234	10,501.00*
Task Related Communication	9.93**	2	3	249	11,952.00**
New Facts	14.45**	2	3	249	11,932.50**
Own Experience & Opinions	4.37	2	3	249	10,823.50
New Theoretical Ideas	3.02	2	3	249	10,599.00
Explicitation	3.72	2	3	249	11,320.50
Evaluation	9.76**	2	3	249	11,920.00**

Table 3 Results of Kruskal-Wallis and Jonckheere-Terpstra Tests for Performance Measures

* p<0.05, ** p<0.01

as well as "Low" and "High". Contrasting "Middle" and "High" did not yield significant 494 results.

When considering the effect sizes, we found a pronounced result for overall task related 496 communication and *New Facts*, when comparing "*Low*" and "*Middle*", which yielding effect 497 sizes of r=-0.22 and r=-0.30, respectively. Furthermore, the contrast between "*Low*" and 498 "*High*" also exhibited noticeable effect sizes for overall task related communication (r=-0.20) and *Evaluation* (r=-0.21). Based on these findings, we accepted our second research hypothesis (H2). 501

Two-step cluster analysis

In line with our research hypotheses, we employed two sets of two-step cluster analysis, 503 namely one on the activity and one on the performance levels. The first set considered 504 participants' overall contributions, contributions posted in "*Café-Talk*" and content-driven 505 forums, as well as participants' hierarchical position. Based on the BIC values, this resulted in 506 an optimal amount of clusters of four. Table 4 summarizes how the hierarchical positions were 507 distributed across the clusters. 508

Interestingly, each hierarchical position was assigned to a separate cluster. Additionally, a 509 new group, namely cluster 4, was identified and labeled as "*Stars*". Table 5 shows that 510 participants from this particular cluster were leading their CoL in terms of quantitative 511 contributions irrespective of their hierarchal position. This striking finding suggested that 512 especially the "*Low*" group might be more complex than initially stipulated. Whereas the majority of the respective groups continued to confirm expectations and mainly followed 514

C	Cluster	"Low"		"Middle"		"High"		Total	
		N	%	N	%	N	%		
1		79	96.34		0		0	79	
2	!		0	81	87.10		0	89	
3	;		0		0	63	85.14	69	
4	ŀ	3	3.66	12	12.90	11	14.86	12	

t4.1 Table 4 Frequencies of hierarchical positions: two-step cluster analysis on activity patterns

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Cluster	Cafe-talk f	forum	Content-driv	ven forums	Total contributions		
	М	SD	М	SD	М	SD	
1	3.28	3.16	7.33	5.98	10.61	7.9	
2	4.57	3.97	9.91	7.25	14.48	9.9	
3	4.86	5.36	9.21	6.43	14.06	9.9	
4	17.27	17.27	26.62	13.90	43.88	26.2	

t5 1 Table 5 Overview results of two-step cluster analysis on activity patterns (as measured by number of posts)

discussions, a small subset of participants was able to "break out" of the common pattern and, 515in the case of "Low", did not exhibit a "fear of speaking up". However, the standard deviations 516for individual measures within the "Star" group were sizeable, suggesting that this group was 517not as homogenous in their behavior as the other clusters. 518

The second cluster analysis focused on performance levels and included final exam grades, 519as well as all subcategories of the task related coding procedure: New Facts, Own Experience & 520Opinions, New Theoretical Ideas, Explication and Evaluation. Here, the BIC results indicated 521an optimal number of five clusters. The summative results are provided in Tables 6 and 7. 522

Similar to our findings from the hypothesis tests, we again found evidence that participants' 523hierarchical position explained differences in observed performance levels. However, the cluster 524analysis also revealed that this relationship was more complex than initially stipulated. More 525specifically, we were able to gain valuable new insights on the participants from the "Low" and 526"High" groups. The majority of these groups performed in accordance with the previously 527developed theoretical framework (Clusters 1 and 3). More specifically, the higher an individual's 528hierarchical position, the higher her performance measures. However, about a third of all members 529of the "Low" group, as well as about half of the participants from the "High" group belonged to 530either cluster 4 or 5. The distinctive feature of cluster 4 was a higher level of messages that could 531be coded as *Explicitation*, as well as a tendency to attain higher grades. However, in terms of the 532latter factor, the observed standard deviation was considerable. Members of cluster 5 exhibited 533higher cognitive levels for their contributions and also attained higher grades than their colleagues. 534Moreover, although the standard deviations were noticeable, this cluster really constituted a 535precedent for the previously discovered "Star" cluster. In order to test for the statistical signifi-536cance of this preliminary impression, we employed another correlation analysis to test for a 537possible relationship between membership of the "Star" cluster and membership in cluster 5. The 538applicable correlation coefficient was $r_s=0.33$ (p<0.01), which indicated that a certain group of 539participants ("Stars") really dominated their CoL, both in terms of the quantity and quality of their 540

Cluster	"Low"		"Middle	e"	"High"	"High"		
	N	%	N	%	N	%		
1	53	68.83		0.00		0.00	5	
2		0.00	75	84.27		0.00	7	
3		0.00		0.00	38	55.88	3	
4	22	28.57		0.00	21	30.88	4	
5	2	2.60	14	15.73	9	13.24	2	

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t7.1	Table 7	Overview results of two-step cluster analysis on activity patterns (as measured by the amount of posts
	per task 1	related subcategory)

t7.2	Cluster	Cluster Exam			Task Related Communication								
t7.3				New Facts		Own Experi & Opi	ience nions	New Theore Ideas	etical	Explicit	ation	Evalua	ation
t7.4		М	SD	М	SD	М	SD	М	SD	М	SD	М	SD
t7.5	1	7.29	0.79	0.51	0.75	0.55	0.80	0.02	0.14	5.15	4.16	0.62	0.99
t7.6	2	7.59	0.85	1.21	1.36	0.80	1.00	0.00	0.00	6.56	4.95	0.92	1.19
t7.7	3	7.46	0.85	1.74	2.19	0.63	0.88	0.05	0.23	6.55	5.00	1.21	1.73
t7.8	4	7.40	1.92	0.88	1.00	0.74	0.85	0.00	0.00	8.02	6.26	0.91	1.29
t7.9	5	7.62	1.80	4.08	2.55	3.80	3.93	0.56	0.71	14.36	9.30	4.24	3.55

contributions. Finally, another closer investigation of this group revealed that the members were predominately situated in 3 out of the 8 regions in which the organization operates. More specifically, one of these three regions was the organization's overall headquarters. Hence, taken together, the two-step cluster analyses provided a more refined and multifaceted picture of how hierarchical positions influence individuals in CoLs. 541

Controlling for other background characteristics and nested data

In order to simultaneously model the three control measures in combination with our main effect, we conducted a third-order partial correlation analysis. Additionally, to account for our nested data, as well as the three control variables, we employed multilevel linear regression modelling to determine whether the discovered impact of hierarchical positions on participants' behavior would remain significant. The applicable results are summarized in Tables 8 and 9, respectively. 551

The results of our third-order partial correlation analysis provided further support for our research 552 hypotheses, as hierarchical positions continued to be significantly and positively correlated with 553 participants' final exam grade, total contributions, task related communication, as well as its subcategories *New Facts* and *Evaluation*. Similarly, the results of our multilevel linear regression 556 analysis, modelling the effect of our explanatory variables on participants' final exam grade, again 556 revealed a significant impact of hierarchical positions. Even more so, when considering the results of 557

t8.1 t8.2	Table 8 Overview of third-order partial correlations between hierar- hierar-		Correlation coefficient
t8.3	(controlling for educational back-	Final exam grade	0.19**
t8.4	ground, prior knowledge and age)	Total contributions	0.12^{\dagger}
t8.5		Café-talk forums	0.06
t8.6		Task related communication	0.14^{*}
t8.7		New fact	0.15*
t8.8		Own opinion / experience	0.09
t8.9		Theoretical Idea	0.04
t8.10		Explicitation	0.07
t8.11	[†] p<0.1, [*] p<0.05, ^{**} p<0.01	Evaluation	0.23**

Explanatory variable	Final exam grade	e				
	Model 1 ^a	Model 2 ^b	Model 3 ^c			
	beta	SD	beta	SD	beta	SD
Intercept	7.03**	0.15	7.4**	0.34	7.75**	0.61
HRC ("Middle")	0.42^{*}	0.19	0.46*	0.21	0.48^{*}	0.20
HRC ("High")	0.42^{*}	0.18	0.42^{*}	0.19	0.46^{*}	0.19
Degree ("MSc")			-0.34	0.27	-0.35	0.27
Degree ("PhD")			-0.39	0.32	-0.35	0.32
Degree ("Other")			0.04	0.40	0.04	0.40
Prior knowledge			0.01	0.02	0.01	0.02
Age					0.01	0.01
Explanatory variable	Task related com	munication				
	Model 4 ^d		Model 5 ^e		Model 6 ^f	
	beta	SD	beta	SD	beta	SD
Intercept	8.45**	1.05	9.20*	3.67	-1.92	4.71
HRC ("Middle")	3.51*	1.45	3.76 [†]	2.10	2.88^{\dagger}	1.53
HRC ("High")	3.77*	1.70	6.64*	2.12	2.30^{\dagger}	1.67
Degree ("MSc")			0.67	2.97	0.27	2.46
Degree ("PhD")			4.24	3.53	1.62	2.95
Degree ("Other")			1.23	4.37	-1.02	3.27
Prior knowledge			-0.19	0.20	0.09	0.12
Age					0.21^{*}	0.09

t9.1 **Table 9** Results multilevel linear regression modelling

[†] p<0.1, ^{*} p<0.05, ^{**} p<0.01

^a BIC=373.71; ^b BIC=389.82; ^c BIC=393.84; ^d BIC=1641.04; ^e BIC=1020.96; ^f BIC=1660.57

^Δ HRC=hierarchical position; Degree=educational background

models 2 and 3, we discovered that none of the control variables significantly interfered with our 558 main effect. Hence, hierarchical positions continued to be a significant predictor for participants' 559final exam grade. In contrast, when considering our models for task related communication, a 560different picture emerged as compared to our preceding analysis. More specifically, when all control 561measures were included in our model (Model 6), the impact of hierarchical positions was dimin-562ished. Instead, age emerged as a significant predictor for participants' behaviour. However, when age 563was left out of the models (Model 4 and 5), we again found support for our research hypotheses. 564Considering these findings, we can therefore stipulate that any possible observed differences in 565activity or performance levels between the different hierarchical positions can neither be explained 566by differences between CoLs, nor by educational background or prior knowledge. Yet, when 567interpreting the results of our study, we had to take into account that participants' age had a 568significant impact on individuals' level of task related communication. 569

Discussion

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This study contributes to the growing body of research that addresses the impact of diversity 571 on training processes within organizations. Moreover, past research has either focused on 572 regular working environments (Jehn and Bezrukova 2004), or failed to acknowledge the 573

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important role of hierarchical positions in mediating collaborative learning (Romme 1996). 574Our study addresses these shortcomings by providing empirical evidence on how hierarchical 575positions influence the behavior of participants within CoLs of a global online training 576program. Our results provide evidence for a significant positive relationship between the 577 hierarchical position of an individual and their level of activity (H1). This provides support 578for researchers like Yates and Orlikowski (1992), who argued that top management will 579proactively set the tone during discussions. In contrast, our findings also fit the study of 580Edmondson (2002), who suggested that participants holding lower hierarchical positions will 581behave more passively when engaging in communication with colleagues from higher up on 582the hierarchical ladder. Even more so, in the study of Edmondson, participants were already 583familiar with each other. In the context of this study, participants were brought together from 584different units and regions, and they had to voluntarily share this information with each other. 585Consequently, being able to identify such behavioral patterns among lower management, this 586suggests even more far-reaching consequences. More specifically, hierarchical positions really 587 do seem to constitute an "800-pound gorilla" (Salas and Kozlowski 2009, p. 468) that 588influences how staff members collaborate. It can therefore be concluded that specific attention 589needs to be paid to these types of interpersonal processes, as they can have a great impact on 590learning initiatives within organizations (e.g., Foldy et al. 2009). 591

Based on the work of Bunderson (2003b), we hypothesized that participants' 592hierarchical position would have a positive influence on their performance levels 593(H2), and our empirical results provided justification for this claim: Additionally, we 594were able to refine our understanding of this relationship. While the majority of the 595"Low" group performed well, a sizeable subset was able to excel, attain high grades 596and contribute high quality posts to the discussion forums. To some extent, this can 597 be interpreted as an indication that learning has taken place, which reflects the work 598of Nonaka (1994), who argued that participants holding lower hierarchical positions 599can learn a lot from their more senior colleagues by simply being subjected to their 600 knowledge and experiences. Alternatively, this can also be regarded as support for the 601 work of colleagues like Zembylas and Vrasidas (2007), who promoted the term 602 "online silence" (p.18) to describe the phenomenon of participants not actively 603 engaging into discussion, while at the same time benefiting from the contributions 604of their colleagues. Similarly, Vrasidas and Zembylas (2003) suggested that this 605 silence does not automatically equate to a lack of learning. Instead, some participants 606 might be prone to reflect on content and discussions, while keeping their views to 607 themselves. 608

We also revealed the existence of a group of "Stars" that dominated their CoL, both in 609 terms of the quantity and quality of their contributions, irrespective of their hierarchical 610 position. This suggests a certain degree of "status equalization" (Sproull and Kiesler 1986, 611 p. 1507). However, this finding also needs to be qualified. Our results clearly indicated that it is 612 possible for some lower level management to "get out of the shackles" and actively contribute 613 to the learning process of CoLs. However, the findings also suggest that this possibility is 614 directly connected to individual's ability to make themselves heard, both in terms of the 615quantity and quality of their contributions. Otherwise, hierarchical positions continue to have a 616 considerable impact on interpersonal processes within organizations. 617

When controlling for differences between CoLs and other background characteristics, we found that participants' age was a significant predictor for participants' level of task related 619 communication. A possible explanation for this is provided by the work of Pelled and colleagues (1999), who showed that age is a career-related attribute. Hence, an employee's age tends to be a predictor of her hierarchical position within an organization. 622

In summary, the results of our study allowed us to better anticipate active participants and 623 stimulate them to engage their colleagues into knowledge sharing. In practice, this could 624 translate into assigning different roles within the CoLs. For example, HRD managers could 625 also consider assigning roles not according to perceived strengths, but rather on the basis of 626 anticipated weaknesses. In practice, this would translate into members of the "Low" group 627 being "discussions leaders", while their colleagues from the "High" group would be asked to 628 take on the role of "minute-taker". This provides members of the "Low" group with a kick-629 start, as they already would be at the centre of attention. Consequently, they may find it easier 630 to share their knowledge and skills and therefore attain a more central position in the learning 631 process. A possible, positive side-effect would be that they also immediately would train their 632 "leadership" skills. Moreover, organizers of future CoLs should incorporate participants" 633 background characteristics, e.g. content expertise, into their placement decision of participants 634 within CoLs. This has been suggested to greatly contribute to the learning experience and 635 outcomes of participants (Dochy and McDowell 1997). In terms of participants' prior knowl-636 edge and professional experience, it might also be worthwhile considering publishing this 637 information before the start of a training activity. The potential benefit would be to provide 638 participants with a clear overview of whom they are collaborating with. After all, creating a 639 *hothouse* for new ideas and thoughts is a valuable contribution to training within organizations 640 (Schlager et al. 2002). However, the atmosphere can be improved when you know who your 641 neighbors are (B. P. Cohen and Zhou 1991). 642

Conclusions

Limitations

The current study exhibits three main limitations that should be taken into account 645when interpreting the presented findings. First, participants' activity was analyzed 646 based on the level of their contributions. Although this provides a valuable approx-647 imation of the underlying relationships, it has limited overall explanatory power. The 648 discussions within the CoLs have also been recorded via transcribed log-files, pro-649 viding information whether contributions were read by colleagues, or whether they 650remained unnoticed. Analyzing this data would provide additional insights on how 651participants from different hierarchical positions behave in relation to each other 652within CoLs. Second, and closely related to the previous limitation, the current study 653 does not consider how participants are connected with each other and whether their 654hierarchical positions might help to predict social network positions within a CoL. 655 This in turn would provide valuable insights about the nature of CoLs and whether 656 they are organic entities, with everyone being connected and thereby having a chance 657 to access the knowledge and experiences of others, or whether they are scatter plots, 658 with its members mainly indulging in monologues that are not considered by their 659colleagues. Finally, while we were able to identify a group of "Stars", we have not 660 yet fully analyzed the underlying factors that might predict their membership in this 661 group. From the preliminary investigation of their background characteristics, it seems 662 that "proximity to headquarters" might be able to explain part of the observed 663 behavior. A more detailed study would enhance our understanding of these partici-664 pants' characteristics and traits. This in turn would provide valuable insights for 665 organizers on how to identify these individuals ex-ante and on how to compose 666 future CoLs that increase the chances of achieving high quality learning outcomes. 667

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Future research

Building upon the findings of this study, future research should further investigate the nature of 669 the identified "Stars". This group, which it not bound by a single hierarchical position, can be 670 considered as the driving force behind CoLs. A better understanding of these members' 671 characteristics and traits would therefore greatly contribute to our understanding of how 672 organizers can compose future CoLs, so as to increase the chances of achieving high quality 673 learning outcomes. Finally, future research should conduct a more exhaustive content analysis, 674 also incorporating the non-task-related contributions within the CoLs. These types of posts 675 have been claimed to influence the learning processes within CoLs (Veerman and Veldhuis-676 Diermanse 2001), by contributing to the atmosphere within collaborative learning environ-677 ments (Hung and Der-Thang 2001). Consequently, incorporating this data would shed addi-678 tional light on whether and to what extent hierarchical positions might influence the way in 679 which participants engage in discussions within CoLs. 680

References

- Alavi, M., Yoo, Y., & Vogel, D. R. (1997). Using information technology to add value to management education.
 The Academy of Management Journal, 40(6), 1310–1333.
- Arbaugh, J. B., & Benbunan-Finch, R. (2006). An investigation of epistemological and social dimensions of teaching in online learning environments. *The Academy of Management Learning and Education*, 5(4), 435–447.
- Argote, L., & Ingram, P. (2000). Knowledge transfer: A basis for competitive advantage in firms. Organizational 688 Behavior and Human Decision Processes, 82(1), 150–169.
- Armstrong, S. J., & Sadler-Smith, E. (2008). Learning on demand, at your own pace, in rapid bite-sized chunks: 690
 The future shape of management development? *The Academy of Management Learning and Education*, 7(4), 571–586. 692
- Arts, J. A., Gijselaers, W. H., & Boshuizen, H. (2006). Understanding managerial problem-solving, knowledge 693 use and information processing: Investigating stages from school to the workplace. *Contemporary Educational Psychology*, *31*(4), 387–410.
 Banerice, M., Capozzoli, M., McSweeney, L., & Sinha, D. (1999). Beyond Kappa: A review of interrater 696
- Banerjee, M., Capozzoli, M., McSweeney, L., & Sinha, D. (1999). Beyond Kappa: A review of interrater agreement measures. *The Canadian Journal of Statistics / La Revue Canadienne de Statistique*, 27(1), 3–23.
- Banfield, J. D., & Raftery, A. E. (1993). Model-based Gaussian and non-Gaussian clustering. *Biometrics*, 49, 803–821.
- Berger, J., & Fişek, M. H. (2006). Diffuse status characteristics and the spread of status value: A formal theory 1. American Journal of Sociology, 111(4), 1038–1079.
- Berger, J., Ridgeway, C. L., Fisek, M. H., & Norman, R. Z. (1998). The legitimation and delegitimation of power and prestige orders. *American Sociological Review*, 63(3), 379–405.
- Bird, A. (1994). Careers as repositories of knowledge : A new perspective on boundaryless careers. *Journal of Organizational Behavior*, 15, 325–344.
- Brower, H. H. (2003). On emulating classroom discussion in a distance-delivered OBHR course: Creating an online learning community. *The Academy of Management Learning and Education*, 2(1), 22–36.
- Bunderson, J. S. (2003a). Recognizing and utilizing expertise in work groups: A status characteristics perspective. Administrative Science Quarterly, 48(4), 557–591.
- Bunderson, J. S. (2003b). Team member functional background and involvement in management teams: Direct effects and the moderating role of power centralization. Academy of Management Journal, 46(4), 458–474.
 710
- Bunderson, J. S., & Sutcliffe, K. M. (2002). Comparing alternative conceptualizations of functional diversity in management teams: Process and performance effects. *Academy of Management Journal*, 45(5), 875–893.
- Caspi, A., Gorsky, P., & Chajut, E. (2003). The influence of group size on nonmandatory asynchronous 715 instructional discussion groups. *The Internet and Higher Education*, 6(3), 227–240. 716
- Caspi, A., Chajut, E., Saporta, K., & Beyth-Marom, R. (2006). The influence of personality on social participation in learning environments. *Learning and Individual Differences*, 16, 129–144. 718
- Chalmers, L., & Keown, P. (2006). Communities of practice and professional development. International Journal of Lifelong Education, 25(2), 139–156. 720

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765766

767

768769

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772 773

774

775

776

777778

Cho, H., Gay, G., Davidson, B., & Ingraffea, A. (2007). Social Networks, communication styles, and learning	721
performance in a CSCL community. Computers & Education, 49, 309–329.	722
Cohen, J. (1992). Statistics a power primer. <i>Psychology Bulletin</i> , 112, 155–159.	723

Cohen, J. (1992). Statistics a power primer. *Psychology Bulletin*, 112, 155–159.

- Cohen, E. G. (1994). Restructuring the classroom: Conditions for productive small groups. Review of Educational Research, 64(1), 1–35.
- Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Gruop effectiveness research from the shop floor to the executive suite. Journal of Management, 23, 239-290.
- Cohen, B. P., & Zhou, X. (1991). Status Processes in Enduring Work Groups. American Sociological Review, 56(2), 179-188.
- Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. Journal of Applied Psychology, 78(1), 98-104.
- Cramton, C. D., & Hinds, P. J. (2005), Subgroup dynamics in internationally distributed teams: Ethnocentrism or cross-national learning? Research in Organizational Behavior, 26, 231-263.
- Cress, U. (2008). The need for considering multilevel analysis in CSCL research-An appeal for the use of more advanced statistical methods. International Journal of Computer-Supported Collaborative Learning, 3(1), 69-84.
- De Laat, M., & Lally, V. (2003). Complexity, theory and praxis: Researching collaborative learning and tutoring processes in a networked learning community. Instructional Science, 31(1-2), 7-39.
- de Wever, B., Schellens, T., Valcke, M., & Van Keer, H. (2006). Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review. Computers & Education, 46(1), 6-28.
- DeChurch, L. A., & Mesmer-Magnus, J. R. (2010). The cognitive underpinnings of effective teamwork: A metaanalysis. Journal of Applied Psychology, 95(1), 32-53.
- Dochy, F., & McDowell, L. (1997). Assessment as a tool for learning. Studies In Educational Evaluation, 23(4), 279-298.
- Dochy, F., Segers, M., & Buehl, M. M. (1999). The relation between assessment practices and outcomes of studies: The case of research on prior knowledge. Review of Educational Research, 69(2), 145-186. doi:10. 3102/00346543069002145.
- Edmondson, A. C. (2002). The local and variegated nature of learning in organizations: A group-level perspective. Organization Science, 13(2), 128-146. doi:10.1287/orsc.13.2.128.530.
- Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. British Journal of Educational Psychology, 70, 113-136.
- Foldy, G. E., Rivard, P., & Buckley, T. R. (2009). Power, safety, and learning in racially diverse groups. The Academy of Management Learning and Education, 8(1), 25-41.
- Garavan, T. N., Carbery, R., O'Malley, G., & O'Donnell, D. (2010). Understanding participation in e-learning in organizations: A large-scale empirical study of employees. International Journal of Training and Development, 14(3), 155–168. doi:10.1111/j.1468-2419.2010.00349.x.
- Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computerâ€ mediated conferencing environment. American Journal of Distance Education, 11(3), 8-26. doi:10.1080/ 08923649709526970.
- Gunawardena, C. N., Lowe, C. A., & Anderson, T. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. Journal of Educational Computing Research, 17(4), 397-431.
- Hakkarainen, K., Palonen, T., Paavola, S., & Lehtinen, E. (2004). Communities of networked expertise: Professional and educational perspectives. Amsterdam: Elsevier.

Hamel, G., & Green, B. (2007). The Future of Management. Boston: Harvard Business School Press.

- Harasim, L. (1993). Collaborating in cyberspace: Using computer conferences as a group learning environment. Interactive Learning Environments, 3, 119–130.
- Hung, D. W. L., & Der-Thanq, C. (2001). Situated cognition, vygotskian thought and learning from the communities of practice perspective: Implications for the design of Web-based learning. Educational Media International, 38(1), 3–12.
- Im, Y., & Lee, O. (2004). Pedagogical implications of online discussion for preservice teacher training. Journal of Research on Technology in Education, 36(2), 155–170.
- Järvelä, S., Järvenoja, H., & Veermans, M. (2008). Understanding the dynamics of motivation in socially shared learning. International Journal of Educational Research, 47(2), 122-135.

Jehn, K. A. (1995). A multimethod examination of the benefits and detriments of intragroup conflict. Administrative Science Quarterly, 40(2), 256–282.

- Jehn, K. A., & Bezrukova, K. (2004). A field study of group diversity, workgroup context, and performance. Journal of Organizational Behavior, 25(6), 703–729.
- Jehn, K. A., Northcraft, G. B., & Neale, M. A. (1999). Why differences make a difference: A field study of 779 diversity, conflict, and performance in workgroups. Administrative Science Quarterly, 44(4), 741-763. 780

 $785 \\ 786$

787

 $788 \\ 789$

 $790 \\ 791$

792

793 794

795 796

797

 $798 \\ 799$

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825 826

827

828 829

830

831

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 $834 \\ 835$

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837

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Intern. J. Comput.-Support. Collab. Learn.

- Joinson, A. N. (2001). Self disclosure in computer mediated communication: The role of self awareness and visual anonymity. *European Journal of Social Psychology*, *31*(2), 177–192. 782
- Kane, G. C., & Alavi, M. (2007). Information technology and organizational learning: An investigation of exploration and exploitation processes. *Organization Science*, 18(5), 796–812. 784

Keegan, D. (1980). On defining distance education. Distance Education, 1(1), 13-36.

Kirwan, C., & Birchall, D. (2006). Transfer of learning from management development programmes: Testing the Holton model. *International Journal of Training and Development*, 10(4), 252–268.

- Krackhardt, D. (1990). Assessing the political landscape: Structure, cognition, and power in organizations. Administrative Science Quarterly, 35, 342–369.
- Lave, J., & Wenger, E. (1991). Situated learning: legitimate peripheral participation. Cambridge: Cambridge University Press.
- Leonard, D., & Sensiper, S. (1998). The Role of Tacit Knowledge in Group Innovation. *California Management Review*, 40(3), 112–132.

Magurran, A. E. (1988). Ecological diversity and its measurement. Princeton: Princeton University Press.

- Milliken, F. J., & Martins, L. L. (1996). Searching for common threads: understanding the multiple effects of diversity in organizational groups. Academy of Management Review, 21(2), 402–433.
- Nachmias, R., Mioduser, D., Oren, A., & Ram, J. (2000). Web-supported emergent-collaboration in higher education courses. *Journal of Educational Technology and Society*, 3(3), 94–104.
- Nembhard, I. M., & Edmondson, A. C. (2006). Making it safe: The effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams. *Journal of Organizational Behavior*, 27, 941–966.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1), 14–37.

Pelled, L. H., Eisenhardt, K. M., & Xin, K. R. (1999). Exploring the black Box: An analysis of work group diversity, conflict, and performance. *Administrative Science Quarterly*, 44(1), 1–28.

Ridgeway, C. L., & Correll, S. J. (2006). Consensus and the creation of status beliefs. *Social Forces*, *85*(1), 431–453.

Rienties, B., Tempelaar, D., Van den Bossche, P., Gijselaers, W., & Segers, M. (2009). The role of academic motivation in computer supported collaborative learning. *Computers in Human Behavior*, 25(6), 1195–1206.

- Robey, D., Khoo, H., & Powers, C. (2000). Situated learning in cross-functional virtual teams. *Technical Communication*, 47(1), 51–66.
- Roblyer, M. D., & Wiencke, W. R. (2003). Design and Use of a rubric to assess and encourage interactive qualities in distance courses. *American Journal of Distance Education*, 17(2), 77–98.
- Romme, A. G. L. (1996). A note on the hierarchy-team debate. *Strategic Management Journal*, *17*(5), 411–417. Rosenthal, R. (1991). *Meta-analytic procedures for social research*. Newbury Park: Sage.
- Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (2000). Methodological issues in the content analysis of computer conference transcripts. *International Journal of Artificial Intelligence in Education*, 11, 8–22.
- Salas, E., & Kozlowski, S. W. J. (2009). Learning, training, and development in organizations: Much progress and a peek over the horizon. In E. Salas & S. W. J. Kozlowski (Eds.), *Learning, Training, and Development in Organizations* (pp. 461–476). NY Routledge: New York.
 820
- Sambrook, S. (2005). Factors influencing the context and process of work-related learning: Synthesizing findings from Two research projects. *Human Resource Development International*, 8(1), 101–119.

Schellens, T., & Valcke, M. (2005). Collaborative learning in asynchronous discussion groups: What about the impact on cognitive processing? *Computers in Human Behavior*, 21(6), 957–975.

- Schippers, M. C., den Hartog, D. N., Koopman, P. L., & Wienk, J. A. (2003). Diversity and team outcomes: The moderating effects of outcome interdependence and group longevity and the mediating effect of reflexivity. *Journal of Organizational Behavior*, 24(6), 779–802.
- Schlager, M., Fusco, J., & Schank, P. (2002). Evolution of an online education community of practice. In K. A. Renninger & W. Shumar (Eds.), *Building virtual communities: Learning and change in cyberspace* (pp. 129–158). New York: Cambridge University Press.
- Simons, T., Pelled, L. S., & Smith, K. A. (1999). Making Use of differences: Diversity, debate, and decision comprehensiveness in Top management teams. *Academy of Management Journal*, 42(6), 662–673.

Snyder, P., & Lawson, S. (1993). Evaluating results using corrected and uncorrected effect size estimates. *The Journal of Experimental Education*, 61(4), 334–349.

Soden, R., & Halliday, J. (2000). Rethinking vocational education: A case study in care. *International Journal of Lifelong Education*, 19(2), 172–182.

- Sproull, L., & Kiesler, S. (1986). Reducing social context cues: Electronic mail in organizational communication. Management Science, 32(11), 1492–1512.
- Stacey, E., Smith, P. J., & Barty, K. (2004). Adult learners in the workplace: online learning and communities of practice. *Distance Education*, 25(1), 107–123. 840

Strijbos, JW., Martens, R. L., Prins, F. J., & Jochems, W. M. G. (2006). Content analysis: What are they talking about? <i>Computers & Education</i> , 46(1), 29–48.	841 842
Button P. Naple M. A. & Owars D. (2000) Technologies of Status Nagatigtion: Status Dynamics in Final	8/12
Sutori, R., Fear, M. A., & Owens, D. (2007). Terminologis of Januar Regonation. Journes Dynamics in Linuar	844
Discussion Groups: Faio Ano: Stanford University, Graduate School of Business.	044
Tachioanaki, 1. (1988). Education, occupation, inerarchy and earnings. <i>Economics of Education Review</i> , 7(2),	040
221–229.	840
Thomas-Hunt, M. C., Ogden, T. Y., & Neale, M. A. (2003). Who's really sharing? effects of social and expert	847
status on knowledge exchange within groups. <i>Management Science</i> , 49(4), 464–477.	848
van der Vegt, G. S., Bunderson, J. S., & Oosterhof, A. (2006). Expertness diversity and interpersonal helping in	849
teams: Why those who need the most help end up getting the least. Academy of Management Journal, 49(5),	850
877–893.	851
Veerman, A., & Veldhuis-Diermanse, E. (2001). Collaborative learning through computer-mediated communi-	852
cation in academic education. Paper presented at the In EURO CSCL 2001. Maastricht: McLuhan Institute.	853
University Maastricht.	854
Vrasidas, C., & Zembylas, M. (2003). The nature of technology-mediated interaction in globalised distance	855
education. International Journal of Training and Development, 7(4), 271–286.	856
Webber, S. S., & Donahue, L. M. (2001). Impact of highly and less job-related diversity on work group cohesion	857
and performance: A meta-analysis, Journal of Management, 27(2), 141-162, doi:10.1177/	858
014920630102700202	859
Weisband S. P. Schneider, S. K. & Connolly, T. (1995). Computer mediated communication and social	860
information: Status salience and status differences <i>Academy of Management Journal</i> 38(4) 1124–1151	861
doi:10.2307/25663	862
Wenger F. McDermott R. & Snyder W. M. (2002). Cultivating communities of practice Boston: Harvard	863
University Press	864
Wolfe I I (100) Why do women feel langed? gender differences in computer-mediated classroom interac-	865
tion computer and composition 16(1) 152-166	866
Vampill S. & NoLong C. N. (2001). Theories guaranting transfer of training. Human Resource Davelonment	867
Tainini, S., & McLean, G. N. (2001). Theorem supporting transfer of training. <i>Trainan Resource Development</i>	869
<i>Guarrenty</i> , 12(2), 195–208. doi:10.1002/fildq.//.	000
rates, J., & Ornkowski, W. J. (1992). Genres of organizational communication: A structurational approach to	809 870
studying communication and media. Academy of Management Review, 17(2), 299–326.	870
Zack, M. H., & McKenney, J. L. (1995). Social context and interaction in ongoing computer-supported	8/1
management groups. Organization Science, 6(4), 394–422.	872
Zembylas, M., & Vrasidas, C. (2007). Listening for silence in text-based, online encounters. <i>Distance Education</i> ,	873
28(1), 5–24.	874
Zhang, Y., Fang, Y., Wei, KK., & Chen, H. (2010). Exploring the role of psychological safety in promoting the	875
intention to continue sharing knowledge in virtual communities. International Journal of Information	876
Management, 30(5), 425–436. doi:10.1016/j.ijinfomgt.2010.02.003.	877
	878