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# Leveraging E-Identities: The Impact of Percieved Diversity on Team Social Integration and Performance

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# LEVERAGING E-IDENTITIES: THE IMPACT OF PERCEIVED DIVERSITY ON TEAM SOCIAL INTEGRATION AND PERFORMANCE

*Les e-identités : impact de la diversité perçue sur l'intégration sociale et la performance de l'équipe*

*Completed Research Paper*

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## **Abstract**

*Virtual teams (VTs) are increasingly being employed by organizations, presenting managers and researchers with challenges that collocated teams do not face. VTs are likely to be diverse and lack opportunities to readily communicate personal information to build relationships. Research on team diversity shows mixed results regarding the impact of diversity on team integration and performance, with both positive and negative impacts observed. This study asks the question: Can we minimize the negative impact of perceived deep-level diversity on performance while still leveraging the benefits of actual deep-level diversity? We examine how technology can be used to influence perceptions of deep-level diversity in order to attenuate the negative impact of diversity. Results show that diversity in general, deep-level, attributes can be influenced via the use of e-identity profiles, providing support for the idea that we can minimize social tension due to deep-level diversity, while still reaping the benefits from actual diversity.*

**Keywords:** Virtual teams, perceived diversity, e-identity, social integration

## **Résumé**

*Cette étude pose la question : peut-on réduire l'impact négatif de la perception d'une diversité de niveau élevé sur la performance, tout en continuant à tirer les avantages de la réalité de cette diversité? Nous examinons comment la technologie peut être utilisée pour influencer les perceptions de la diversité de niveau élevé afin d'atténuer l'impact négatif de la diversité.*

## **Introduction**

As competition from foreign and global sources increases, organizations are looking for ways to expand their reach and range. The use of virtual teams is one way in which businesses respond to global competition. Virtual teams (VTs) are composed of members who span spatial, temporal and relational boundaries, and communicate primarily through information and communication technologies (Jarvenpaa et al. 1998; Martins et al. 2004). The Wall Street Journal reported that over half of the companies with more than 5000 employees use virtual teams (de Lisser 1999). Despite the fact that VTs save organizations time and money, and provide access to expertise from an expanded labor market, the use of this form of team presents new challenges (Duarte and Snyder 1999; Jarvenpaa et al. 1998).

One significant challenge is the limitations virtual exchange places on VT members' opportunities to socially integrate. Social integration reflects the degree to which team members feel "psychologically linked" to other team members while trying to achieve a shared goal (O'Reilly et al. 1989 p. 22). It has been identified as an important determinant of team performance. Indeed, social integration has been found to positively influence team performance (Harrison et al. 1998; Harrison et al. 2002; O'Reilly et al. 1989). However, compared to collocated teams, VTs face unique challenges in promoting and achieving social integration. VT members do not have as many opportunities to communicate as collocated teams. Collocated team members have more opportunities to engage in informal conversations around the proverbial water cooler (Kiesler and Cummings 2002). As a result VT members are less likely to exchange personal information (Liebe et al. 1996; Powell et al. 2004) and are more task-oriented than their collocated team counterparts (Hiltz et al. 1986).

In addition, because VTs span geographic boundaries, they tend to be much more diverse in terms of demographics, functional background, and work-related experiences (Martins et al. 2004). Team diversity influences member satisfaction, team cohesion, and team performance (Ashkanasy et al. 2002; Harrison et al. 1998; Harrison et al. 2002; Jackson et al. 2003; Jehn et al. 1999; Pelled et al. 1999). Team diversity is negatively related to social integration (Harrison et al. 1998; Harrison et al. 2002; Jackson et al. 1995). VTs, therefore, face two critical problems with regard to social integration. First, spatial, temporal, and relational boundaries reduce the opportunities for VT members to socially integrate. Second, VTs tend to be more diverse and team diversity is negatively related to social integration. This represents a significant problem for VTs because this social dimension of team work is important to team performance (Baltes et al. 2002; Ilgen et al. 2005; Saphiere 1996).

In light of the challenges identified above, our research is driven by the following question: "How can we promote social integration in virtual teams?" While there is an abundance of research examining the impact of diversity and social integration on performance in collocated teams, very little research has been done in the area of social integration and diversity in VTs (Martins et al. 2004). In this paper we propose that social integration in VTs may be enhanced by leveraging the IT artifact. In particular, we propose that by providing VTs with information about team member characteristics via identity profiles similar to those created for social networking websites (e.g., myspace.com, facebook.com), VTs have more opportunity to exchange personal information. We refer to this personal information as e-identity profiles, which we define as a collection of selected information about an individual's profile that is presented in an electronic format. Information contained in an e-identity profile might range from simple demographics, such as age, gender, and ethnicity, to more psychologically-based traits, such as personality, preferences, interests, and abilities. These e-identity profiles can speed up the exchange of personal information among VT members increasing social integration. In addition, these e-identity profiles can be leveraged to present and highlight information that would lead diverse teams to believe that they are similar, reducing the negative impact of team diversity on social integration.

In this paper we report on a laboratory study of 46 virtual teams. Half of the teams were randomly assigned to the e-identity profile treatment and the other half to a control group. The e-identity profiles were configured to only present similar personal information to team members. The use of e-identity profiles was expected to moderate the relationship between actual team diversity and perceived team diversity. Perceived diversity was expected to reduce team social integration. Social integration was hypothesized to positively impact team performance. The rest of the paper is organized as follows. The next section introduces the theoretical background and hypotheses, followed by the research methodology, data analysis procedures, and results. The paper concludes with a discussion of the findings, and implications for future research and practice.

## Theoretical Background and Hypotheses

### *Diversity: Background and Theory*

Diversity refers to “the distribution of personal attributes among interdependent members of a work unit” (Jackson et al. 2003 p. 802). The extent to which it impacts teams is not a simple matter. Researchers have examined various dimensions and types of diversity. Team diversity can be defined as either surface-level or deep-level diversity (Harrison et al. 2002). Surface-level diversity relates to the differences among team members in demographic characteristics such as age, gender, and race (Harrison et al. 2002). Deep-level diversity refers to the differences among team members in their psychological characteristics such as personality, values, and attitudes (Harrison et al. 2002). Surface-level diversity dominates much of the literature on team diversity and team performance (Bantel and Jackson 1989; Gruenfeld et al. 1996; Harrison et al. 1998; Jehn et al. 1999; O’Reilly et al. 1989; Watson et al. 1993).

Other studies have looked at the effect of deep-level diversity—having operationalized it as functional or occupational diversity—on teams working on problem-solving tasks (Barsade et al. 2000; Carpenter 2002; Pitcher and Smith 2001; Watson et al. 1998). The results have been mixed with some studies finding positive relationships, others finding negative relationships, and yet others finding no relationship between deep-level diversity and team performance (Horwitz and Horwitz 2007; van Knippenberg and Schippers 2007; Williams and O’Reilly 1998). The extant literature suggests that team diversity can, on the one hand, increase team performance by providing multiple sources of information and viewpoints but can, on the other hand, reduce team performance by adversely impacting team social integration which limits a team’s ability to exploit the informational benefits of diversity (Dahlin et al. 2005).

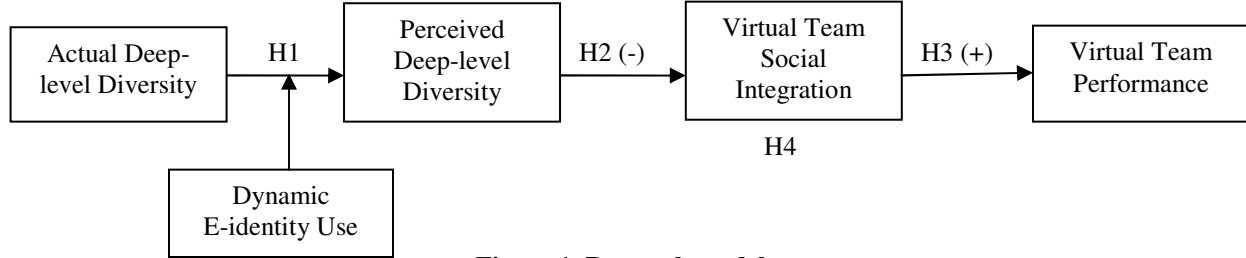
Although findings vary widely, researchers generally agree on the grounding theories used to explain how diversity impacts team functioning (van Knippenberg and Schippers 2007; Zhang et al. 2007). Social identity theory and self-categorization theory offer rich theoretical lenses and are the most widely cited (Jackson et al. 2003). Social identity theory describes both the cognitive and motivational forces driving identification within and across groups. This theory holds that members of a group will establish a group identity and show preference for members of their own group, over out-group members. Membership in the group is incorporated into an individual’s identity and becomes a behavioral motivator as the individual internalizes and conforms to the collective norms, wishes, and values of the group (Tajfel 1978; Tajfel and Turner 1979).

Self-categorization theory operates in a similar way. This theory holds that people tend to group others into social categories based on personal attributes. This helps us “make our perceived world more predictable and controllable” (Zimbardo and Leippe 1991 p. 236) by organizing the multitude of information about people and their behaviors into predefined categories (Turner 1985). In order to reduce cognitive dissonance and increase self-esteem, people develop more positive perceptions of the group they belong to and more negative perceptions of other groups (Hogg and Abrams 1988). These two theories explain how and why individuals tend to associate with others who they perceive to be like them. We draw on these theories as the foundation for our hypotheses about the effects of perceived deep-level diversity in VTs. Our research model is presented in Figure 1.

### *Perceived Deep-level Diversity*

Harrison et al. (2002) studied the impact of time on the effects of surface- and deep-level diversity on social integration. Both types of diversity negatively impacted social integration, but over time, deep-level diversity had a stronger influence on team social integration and, ultimately, team performance (Harrison et al. 2002). Despite this important finding, much of the prior literature has continued to examine the impacts of surface-level diversity in collocated teams (Jackson et al. 2003). What makes diversity in VTs unique is that surface-level characteristics are not readily-identifiable (or at least less salient) because VT members may never meet face-to-face. Although it is possible that the style of communication might reveal some surface-level attributes of the sender, research has found that VT members normally are not able to accurately identify other members’ gender through electronic messages (Nowak 2003).

Prior research has also focused on actual diversity; however Harrison et al., (2002) argued that “if differences are to be meaningful, they must be perceived” (p. 1032). Harrison and his colleagues found that the impact of actual diversity is mediated through perceived diversity. In their study, perceived diversity explained more variance in



**Figure 1. Research model.**

team performance than did actual diversity. In fact, task requirements and work force composition dictate the membership of virtual teams and ultimately their level of actual team diversity. As a result managers may have very little opportunity to reduce the actual deep-level diversity of VTs. However, if perceived deep-level diversity is what really influences social integration, then there is an opportunity to invoke interventions which could change team member's perceptions of team diversity. As a result, this research focuses on perceived deep-level team diversity.

There is a strong positive relationship between actual deep-level team diversity and perceived deep-level team diversity (Harrison et al. 2002). However, if team members are presented with information about their teammates that leads them to believe that their diverse teams are in fact homogenous, their perception of team diversity should decrease. In this case the relationship between actual team diversity and perceived team diversity should weaken. In short, team members should believe that their teams are more homogenous because they are only exposed to information that leads them to believe that they are similar to their team members. However, in teams not exposed to e-identity profiles the relationship between actual team diversity and perceived team diversity should remain strong and positive. As a result, theory would suggest:

*H1: Presenting only similar information via the e-identity profile to virtual team members will weaken the relationship between actual deep-level and perceived deep-level diversity, compared to virtual teams which receive no information about their team members.*

Studies which have examined deep-level diversity have found that attitudinal and value similarity is associated with higher group cohesiveness (Terborg et al. 1976), subordinate satisfaction, performance ratings, and pay ratings (Turban and Jones 1988). Attitudinal and value diversity have been shown to be associated with decreased satisfaction and organizational commitment and with increases in turnover (O'Reilly et al. 1989) and conflict (Barsade et al. 2000). Studies of deep-level diversity and attitudinal or value-similarity generally attribute these findings to psychological attraction. Research related to homophily, the principle that people are attracted to similar others, shows that people find it much more pleasurable to interact with individuals they think share similar beliefs, values and attitudes with them (McPherson et al. 2001). According to Swann (1983)'s self-verification theory: interaction with similar others reinforces and verifies our own beliefs, values and attitudes. We are also more likely to trust those who we perceive to be similar; additionally, trust has been shown to be positively associated with team social integration (Julian et al. 2004).

Research related to group identification supports this argument. To identify oneself with a group, an individual needs to feel that their interests, values, and behaviors are similar to those of the group. If team members feel that the group is not homogeneous they may not feel a sense of identification with the group. Identification is strongly linked to social integration. Although this relationship has not been explicitly examined in a virtual context, we expect these relationships to hold. Based on these arguments, we hypothesize:

*H2: Perceived deep-level diversity will negatively influence virtual team social integration.*

### **Team Social Integration**

Team social integration is strongly related to positive team outcomes (Ilgen et al. 2005; Mannix and Neale 2005; O'Reilly et al. 1989). Social integration is negatively related to turnover in teams (O'Reilly et al. 1989) and positively related to team performance (Chidambaram 1996; Gonzalez et al. 2003; Harrison et al. 1998; Harrison et

al. 2002). Teams high in social integration are able to put aside individual team member's personal interest and direct their efforts toward reaching team goals (Harrison et al. 2002), which in turn reduces team conflict (Mortensen and Hinds 2001). Team social integration is one of the most commonly studied team processes, as it reflects a number of sub-concepts: cohesiveness, satisfaction, and team viability, all of which are positively related to team performance (Mannix and Neale 2005).

Diversity does not directly impact team performance, but rather, functions through a mediating process (Harrison et al. 2002). Diversity influences team outcomes through social integration, or some subset of social integration (Harrison et al. 1998; Harrison et al. 2002; Jackson et al. 2003; Mannix and Neale 2005; O'Reilly et al. 1989). Team social integration should be particularly important in a VT context. Thus, consistent with prior research, we offer the following hypotheses. Figure 1 shows the research model we test.

*H3: Team social integration will positively influence virtual team performance.*

*H4: The impact of perceived deep-level diversity on virtual team performance will be mediated by team social integration.*

## **Research Methodology**

### ***Subjects***

One-hundred-seventy-three students from a medium-sized university in the southern United States participated in the experiment. 70% were men, 30% were women, and the average age was 22.3 years old (SD = 4.0). The participant pool was 79% White, 12% Asian/Pacific Islander/Indian, 4% Black/Non-Hispanic, 3% Native American/Alaskan Native/Hawaiian Native and 2% Hispanic. Four of the participants were unable to log in to the chat session or complete the final survey and thus their data were eliminated from the data set. The final sample size was 46 teams, composed of 169 subjects. A power analysis, using a desired R-squared value of .20, suggests that this is a sufficient sample size to observe a medium effect size (Cohen 1988). There were 23 teams in each condition and team size ranged from 3 to 5, with an average size of 3.67 members.

### ***Procedure***

Upon arrival to the behavioral lab, each participant was randomly assigned to either the treatment or control condition. The room assignment was such that no team members were in the same room, allowing us to simulate the virtual team experience and preventing team members from knowing the actual identity of their teammates. We developed an e-identity profile application that was designed to capture information from team members about their values, beliefs, and attitudes. The application was also designed to take the information supplied by each participant and display it to other team members. The information submission portion of the profile application presented a number of questions pertaining to the values, beliefs, and attitudes of each participant. Using radio buttons and check boxes, participants were instructed to indicate which attributes (values, beliefs, and attitudes) were most congruent with their own. All participants in the study filled out information on this profile application. Upon completion of this initial step, participants in the treatment condition were then presented with a set of web-pages containing information on the attributes of their teammates. Specifically, each team member's webpage showed the username in large, bold, letters at the top of the page, followed by a list of attributes about a particular team member. Based on an algorithm developed by the first author, each participant in this condition was only able to see the attributes of a teammate that matched their own (based on the information that participant supplied on the information submission portion of the application). To illustrate, one team member, Sarah, indicates in her submitted profile that she is interested in environmental issues, and that she is a highly religious person. Her teammate, John, says he is also interested in environmentalism, but is not at all religious. When Sarah accesses John's profile, she will see an item in the list of attributes which says that John is interested in environmental issues, but she will not see information about his religious beliefs. Upon completing their profile information, participants in the control condition were not presented with information on their teammates. Instead, a webpage appeared which thanked them for providing their information. Following the use of the e-identity profile application, teams then worked on a task via an online chat application and completed a final survey which assessed their perceptions of diversity and team social integration. They were then debriefed and dismissed.

## **Team Task**

We selected a task type from McGrath's Group Task Circumplex (1984), which offers a framework for categorizing task types in a mutually exclusive, yet comprehensive manner. Based on our interest in influencing perceptions of deep-level diversity, the primary criterion for selecting the team task was that the task should activate or engage deep-level attributes such as personal values, personality characteristics, knowledge, and perspectives. A secondary criterion for task selection was that the task had a relatively objective performance metric to reduce the possibility of source bias.

We selected Straus and McGrath's (1994) judgment task in which teams were asked to determine disciplinary action for a fictitious case involving a graduate teaching assistant who accepted a bribe from the basketball team's star player to change an exam grade. There were five issues to be settled, which pertained to the various actors involved and/or impacted by the case. Teams were given 3 to 5 alternative solutions to each issue and were asked to discuss the alternatives and agree on one solution for each issue. Further, they were told to attempt to satisfy the conflicting interests between members of each of three constituencies and that the more their solution balanced the interests of all parties, the better they would perform. For additional details about the task, the interested reader is referred to Straus and McGrath (1994).

Each team member was given 10 minutes to read the 3.5 page case and think about the decisions they would make. Prior research using this task suggests that 10 minutes is sufficient time for participants to read and digest the details of the case. The teams did not move forward with the task until all participants had read the case. Following this, the teams logged into their chat rooms and were given 20 minutes to discuss the case and attempt to reach a consensus on each of the five issues. Finally, they were given 5 minutes for each team member to record the group's decisions, along with a short explanation of why their team arrived at a particular decision.

## **Measures**

### **Actual Deep-level Diversity**

Following Harrison et al. (2002), actual deep-level diversity (ADD) was computed by using the within-group standard deviation on multiple variables related to deep-level attributes. This information was collected via the e-identity profile. We used one-item measures of the strength of terminal values, attitudes (e.g. towards education), interests (e.g. types of hobbies), and personality attributes (e.g. degree of conscientiousness), to name a few. The selection of these items was determined by the corresponding measures used for perceived diversity. Most items were measured on a 5 point Likert-type scale, except for categorical items (e.g. major), which were measured using Blau's index (Blau 1977). We then computed the average standard deviation of these items to give an overall measure of ADD.

### **Perceived Deep-level Diversity**

Measures for perceived deep-level (PDD) were also adopted from Harrison et al. (2002). On a five-point, Likert-type scale, individuals indicated the extent to which they felt their group was "very different" (1), to "very similar" (5) on thirteen deep-level characteristics ( $\alpha = .92$ ). These thirteen items included perceptions of diversity in values, attitudes, interests, personalities, priorities, conflict and communication styles, skills, experience, and others.

### **Social Integration**

Following Harrison et al. (2002), we assessed team social integration by way of multiple measures of social attraction, including cohesiveness, the Job Descriptive Index, and willingness to work together in the future. The cohesiveness measure consists of five items assessing strong disagreement (1) to strong agreement (7) with statements such as "I feel I am really part of my team" (Seashore 1954). A fourteen-item measure from the Job Descriptive Index (Smith et al. 1969) assessed each group member's evaluation of their team members' characteristics (e.g., boring, slow, and responsible). Added to this was a measure on the same seven-point Likert scale, which assessed an individual's willingness to work with their team in the future. Due to their high correlations and the results of the principal components analysis, we standardized and averaged the ratings from each measure to generate an overall measure of team social integration ( $\alpha = .96$ ).

## Team Performance

Team performance was assessed by measuring the overall effectiveness of the decisions made on the judgment task. Straus and McGrath (1994) devised a scoring scheme which is composed of two sets of point values for each of the alternative solutions to the five issues. One set of points reflects the degree to which a particular alternative supports a given constituency's interest. The other set of points is a weight which reflects the importance of that issue for a given constituency. Each teams' set of decisions were given three scores which corresponded to the point of view of each constituency. The overall team performance score was the product of the three constituency scores. This procedure yields the highest score for the combination which produces the greatest degree of balance among the three competing interests.

<b>Table 1. PCA Results - Rotated (Varimax) Component Matrix</b>			
<b>Survey Item</b>	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>
<b>Perceived Deep-Level Diversity - We are similar in:</b>			
1. Our personal values	-0.21	0.33	<b>0.79</b>
2. Our attitudes about work	-0.25	0.23	<b>0.79</b>
3. Our interests outside of school	-0.22	0.33	<b>0.73</b>
4. Our personalities	-0.23	0.14	<b>0.72</b>
5. Our priorities	-0.18	0.16	<b>0.73</b>
6. Our commitment to working hard on this task	-0.17	<b>0.83</b>	0.17
7. Our styles for handling conflict	-0.28	0.41	0.35
8. The ways we communicate with each other	-0.18	0.56	0.44
9. How we think our work should be done	-0.16	<b>0.73</b>	0.37
10. Our skills	-0.32	<b>0.71</b>	0.22
11. Our attitudes about education	-0.08	0.36	0.28
12. Our relevant experience for this task	-0.21	<b>0.82</b>	0.14
13. Our general abilities to do a task like this	-0.33	<b>0.75</b>	0.15
<b>Social Integration</b>			
1. I feel I am really part of my team.	<b>0.76</b>	-0.27	-0.20
2. I wouldn't want to move to another team.	<b>0.83</b>	-0.14	-0.21
3. Our team gets along.	<b>0.78</b>	-0.21	-0.13
4. Our team sticks together.	<b>0.74</b>	-0.25	-0.28
5. Team members help each other on the task	<b>0.77</b>	-0.30	-0.13
6. Willingness to work together in the future	<b>0.80</b>	-0.08	-0.21
7. Standardized Job Descriptive Index Score	<b>0.76</b>	-0.24	-0.27
<b>Eigenvalues</b>	9.23	2.13	1.53
<b>Cumulative % of Variance Explained</b>	24.34	45.52	64.43



### **Control variables**

We also measured and controlled for surface-level attributes (demographics). We included surface-level variables in our analysis, but observed no significant impact, thus they are not reported. The non-significant impact is likely due to both the homogeneity of our sample (e.g. 70% men, 79% white), and the fact that team members were not able to assess the surface level characteristics of all their team members.

### ***Instrument Validation***

Principal Components Analysis (PCA) was used to assess convergent and discriminant validity and to reduce the number of items to a smaller set. A varimax rotation was employed and the results initially suggest a three-factor solution, based on the number of eigenvalues greater than 1.0. The results of the PCA are presented in Table 1.

The team social integration items load together on one separate factor, as expected. The diversity construct, however, did not behave as expected. The items for PDD load on two separate factors. As Table 1 shows, the first five items load on one factor, while the remaining items load on a second factor. It is recommended that items with component loadings  $< .70$  be dropped from analysis (Jolliffe 1986). Items 7, 8, and 11 meet this criteria. They do not appear to load strongly on any of the three factors, and, thus, were dropped from further analysis. Judging from the content of these items, it is likely that they were perceived as not highly relevant for this particular context. For example, perceptions of similarity in “our styles for handling conflict” (item 7) may not have been relevant because these teams were not long-standing teams and would not have had enough, if any, experience in determining one another’s methods for dealing with conflict.

This subsequent analysis suggests two dimensions of PDD. One dimension revolves around the perception of diversity as it relates to general deep-level characteristics, such as general values, attitudes, interests, etc. The second dimension seems to capture the perception of diversity as it relates to a particular task, such as commitment to working hard on the task and relevant experience for a task. Based upon the nature of the items, we have chosen to term these two constructs Perceived Deep-level Diversity: General (PDD-General), and Perceived Deep-level Diversity: Task Relevant (PDD-Task). The three-factor solution accounts for 73% of the variance in the data. The Cronbach’s alpha coefficients for PDD-General and PDD-Task are .90 and .92, respectively.

### **Analysis and Results**

The hypotheses were tested using OLS regression. Before conducting the analysis, we first computed the intraclass correlations (ICC1) to determine whether group membership accounted for a significant amount of variance in the data. If group membership is a factor, then it is appropriate to aggregate the individual scores to the team level (Klein and Kozlowski 2000). We computed ICC(1)s for PDD-General, PDD-Task, and social integration. ICC(1) coefficients for PDD-General, PDD-Task, and social integration, were .41 ( $F = 2.66$   $p < .05$ ), .32 ( $F = 3.34$ ,  $p < .01$ ), and .38 ( $F = 4.43$ ,  $p < .01$ ), respectively. As these values are statistically significantly greater than zero, they indicate that group membership does account for variation in the data, and thus it is appropriate to aggregate to the team level. ICC(2) reflects the stability of the team-level means. ICC(2) coefficients are .52, .63, and .69, respectively. This suggests stable team-level means. In light of this information, we aggregated the individual within-team data to the team level by standardizing (due to differences in scales) and averaging the responses, yielding one score for each variable, for each team.

The descriptive statistics and inter-construct correlations for the study variables are shown in Table 2. As expected, the diversity variables are negatively correlated with both social integration and team performance, but are positively correlated with each other. Social integration and team performance are positively correlated.

### ***E-identity Profiles: Moderating Impact***

Hypothesis 1 predicted that the provision of similar information through the e-identity profiles will moderate the relationship between ADD and PDD, such that treatment teams will have a lower perception of deep-level diversity compared to teams which receive no information. Given that our instrument analysis suggested the presence of two deep-level diversity constructs, we examined the data in order to observe the impact on both PDD-General and PDD-Task. E-identity use was dummy-coded, with 1 representing teams that used the e-identity profile and 0 representing those that did not.

Variable	Mean	S.D.	1	2	3	4	5	6	7
1. Team Size	3.63	0.53							
2. Ave GPA	3.08	0.23	.17						
3. Ave ADD	0.57	0.25	-.18	.09					
4. PDD-General	3.40	0.65	-.26	-.24	.47**				
5. PDD-Task	3.10	0.74	-.25	-.19	.39**	.68**			
6. Social Integ.	5.35	0.59	.19	.11	-.49**	-.67**	-.68**		
7. Performance	4439.50	2904.33	.02	.04	-.56**	-.74**	-.77**	.72**	
8. E-id*	0.50	0.51	.21	.11	-.35*	-.50**	-.51**	.53**	.55**

n=46; \* p<.05 \*\* p<.01; \*E-ID = E-identity; a dummy variable (0 = no E-id use; 1 = E-id use)  
Notes: ADD – Actual Deep-level Diversity; PDD – Perceived Deep-level Diversity;

We mean-centered ADD, PDD-Task, and PDD-General to reduce multicollinearity in our model (Aiken and West 1991). All resulting variance inflation factors (VIFs) were under 1.4, indicating that multicollinearity is not an issue. ADD and e-identity use were entered into the regression equations as main effect predictors. We then added the moderator term, which was created by multiplying the ADD variable by the e-identity use variable. Results are shown in Table 3.

		DV: PDD-General	DV: PDD-Task
		$\beta$	$\beta$
<b>Step 1: Main Effects Model</b>			
	ADD	.36***	.24*
	E-id Use	-.37***	-.43***
<b>Step 2: Interaction Model</b>			
	ADD	.79***	.35
	E-id Use	-.33**	-.42***
	ADD X E-id Use	-.50**	-.13
	F	12.09***	9.86**
	$\Delta F$	5.67**	.31
	Adj-R <sup>2</sup>	.40***	.28*
	$\Delta$ Adj-R <sup>2</sup>	.08**	.005

Notes: n = 46; \* p < .10 \*\* p < .05 \*\*\* p < .01; E-id use is a dummy variable (0 = no E-id use; 1 = E-id use); ADD – Actual Deep-level Diversity; PDD – Perceived Deep-level Diversity

The significance of the interaction term in the case of PDD-General ( $\beta = -.47$ ,  $p < .05$ ) indicates that use of the e-identity profile influences the relationship between ADD and PDD-General. The interaction term explained significant additional variance over that explained by the main effects model ( $\Delta R^2 = .08$ ,  $\Delta F = 5.67$ ,  $p < .05$ ). The non-significance of the interaction term in the case of PDD-Task ( $\beta = -.22$ ,  $p > .10$ ) suggests that we were not able to manipulate the perception of deep-level diversity when it came to those attributes which were more task-relevant. To

evaluate how the use of the e-identity profile influences the relationship between ADD and PDD-General, we plotted the interaction. Figure 2 shows that when ADD is low, PDD-General is low for both the teams which used the e-identity profiles and the teams which did not. However, in the case of higher ADD, the slope of the line representing the relationship between ADD and PDD-General is steeper for teams not using the e-identity profiles, compared to those using the e-identity profiles. This indicates that the use of the e-identity profile tends to attenuate the linear relationship between ADD and PDD-General. As we were able to influence perceptions of PDD-General, but not PDD-Task, we consider H1 partially supported.

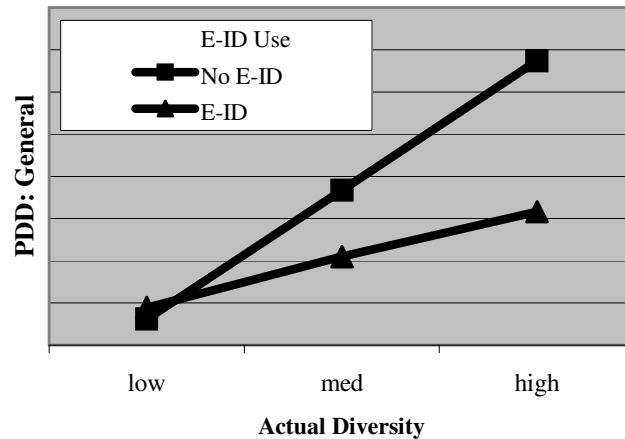


Figure 2. Interaction plot for Actual Deep-level Diversity \* E-identity Use

### *Effect of Perceived Deep-level Diversity on Team Social Integration*

To test H2, which hypothesized that PDD will negatively influence social integration, we regressed social integration on the two types of PDD. The results can be seen in step 2 of Table 4. The overall model is significant ( $p < .001$ ) and explains 47% of the variance in social integration. PDD-General and PDD-Task are both significant ( $\beta = -.31, p < .001, \beta = -.48, p < .001$ , respectively). From this analysis, we conclude that as both general and task-relevant diversity increases (the value for PDD gets smaller), social integration decreases. Thus, H2 is supported.

### *Effect of Team Social Integration on Team Performance*

H3 predicts that social integration will have a positive influence on performance. To test this hypothesis, we regressed team performance on team social integration. The results show a positive, significant relationship ( $\beta = .32, p < .05$ ). Social integration explains 27% of the variance in team performance, after controlling for PDD-General and PDD-Specific ( $\Delta R^2 = .10$ ). Hence, H3 is supported and we conclude that social integration positively influences team performance.

### *Mediating Effect of Team Social Integration*

We hypothesized that the impact of PDD on team performance would be mediated by social integration. To test this hypothesis, we followed Baron and Kenny's (1986) steps for mediation analysis. Table 4 shows PDD-General and PDD-Task are significantly related to team performance. In step two, we show that PDD-General and PDD-Task are significantly related to social integration, and in step three, PDD-General and PDD-Task are significantly related to team performance in the presence of social integration. Further, the impact of PDD-General and PDD-Task weakens in the presence of social integration, suggesting that this variable partially mediates the impact of the two diversity constructs on team performance (Baron and Kenny 1986). Thus, we conclude that social integration partially mediates the effect of PDD on team performance. H4 is partially supported.

## Discussion

The purpose of this research was to expand our understanding of diversity and its impact in VTs and to examine the possibility of influencing perceived diversity through the use of e-identity profiles. Table 5 shows a summary of the hypotheses and outcomes of our analysis. Overall, we found support for our hypothesis that it is possible to influence perceptions of diversity by showing team members similar identity information. Further, we found that teams differentiate between deep-level diversity attributes, such that they perceive a difference between general and task-relevant attributes. While it is possible to influence perceptions of general deep-level attributes, it was not possible to do so for task-relevant attributes. Consistent with previous research, we found that PDD, both general and task-relevant, negatively impact social integration and team performance, and that the effect on performance is partially mediated through social integration.

	<b>1: DV=Team Performance</b>	<b>2: DV=Social Integration</b>	<b>3: DV=Team Performance</b>
Team Size	<b>-.23</b>	<b>-.02</b>	<b>-.23***</b>
Ave GPA	<b>-.09</b>	<b>-.02</b>	<b>-.09</b>
ADD	<b>-.22**</b>	<b>-.19</b>	<b>-.18*</b>
PDD-General	<b>-.38***</b>	<b>-.29*</b>	<b>-.32***</b>
PDD-Task	<b>-.50***</b>	<b>-.42***</b>	<b>-.42***</b>
Social Integration	<b>--</b>	<b>--</b>	<b>.19*</b>
R <sup>2</sup>	<b>.74</b>	<b>.51</b>	<b>.76</b>

n=46; p<.10 \*\*p<.05 \*\*\*p<.01  
Notes: standardized coefficients are reported; ADD – Actual Deep-level Diversity; PDD – Perceived Deep-level Diversity

### *Theoretical Contributions and Implications*

The current study makes several theoretical contributions. First, it reveals that the perception of deep-level diversity is not uni-dimensional, as previously thought (Harrison et al. 2002). We observed that VT members distinguish between general deep-level attributes and task-relevant deep-level attributes. This may be due to the idea that, in not meeting one another face-to-face, VTs are more sensitive to deep-level identity characteristics. Social Information Processing Theory would support the idea that individuals who communicate in a reduced-cues context (e.g., computer-mediated) are more sensitive to the information they do receive (Walther 1996).

Another perspective might be that teams which interact face-to-face have more “noise” in their environment, thus diminishing their ability to discern subtle differences in deep-level characteristics. Harrison et al. (2002) examined similar team processes in collocated teams, but did not observe any differentiation in the deep-level diversity construct. As their participants were collocated and interacting face-to-face, it is possible that the effects we observed for VTs were not strong enough to be detected by their collocated teams. Perhaps team members were subjected to more informational “noise” due to the presence of surface-level information.

This study contributes to the literature on VTs, by providing researchers with additional ammunition to support the idea that VTs are inherently different from collocated teams, and thus theorizing about VTs should account for these potential differences. That said, the differentiation between general and task-relevant attributes cannot be definitively attributed to the task-orientation of VTs, so a promising direction for future exploration would be to replicate this study in collocated teams. If collocated teams tend not to distinguish between general and task-relevant attributes, we would have more reason to believe that this effect is due to the differences between virtual and collocated teams (e.g., task-orientation, reduced social cues, and exchange of social information).

**Table 5. Summary of Hypotheses and Outcomes**

Hypothesis		Support?	Observed Outcome
H1	Use of e-id profile will influence relationship between ADD and PDD such that those teams using the e-id will have lower PDD	Partially Supported	E-id profile influences relationship between ADD and PDD-General, but not between ADD and PDD-Task
H2	PDD will negatively influence social integration.	Supported	Both types of PDD negatively impact social integration.
H3	Social integration will positively influence performance	Supported	Social integration positively influences performance
H4	Impact of PDD on performance will be mediated by social integration.	Partially Supported	Social integration partially mediates effect of both PDD variables on performance

A second contribution to the literature is the step made towards beginning to resolve some of the contradictory findings in diversity research. We were able to show that it is possible to influence perceptions of deep-level diversity and thus influence the social dimension of team work through the use of e-identity profiles. Thus, we provide researchers with a platform from which to begin examining the idea that the contradictory findings regarding the impact of diversity on team performance may be attributed to the negative influence of social conflict caused by diversity and the competing positive influence of multiple knowledge sources, skills, and perspectives. By showing that it is possible to influence perceptions of diversity, future research might look to ways in which we might increase the saliency of multiple knowledge sources, skills, and perspectives, thus optimizing the balance of social tension and cognitive resources.

Finally, our study contributes to the literature on VTs. Diversity in VTs has been understudied (Martins et al. 2004). Our findings suggest that VTs may respond to the effects of diversity and social integration in accordance with their unique qualities. For example, the stronger impact of task-relevant identity information, as compared to general information, appears to align with VTs' greater task-orientation. In addition, we found that social integration partially mediates the relationship between PDD and team performance, with PDD-Task having a stronger impact on performance than social integration. While Harrison et al. (2002) found support for social integration completely mediating the impact of PDD on performance, they examined collocated student teams who worked together over the course of a semester. Our finding of partial mediation may be attributed to the fact that the teams in this study were VTs which worked on a single task at one point in time. The lack of extended, face-to-face contact, in addition to a suppression of social context cues due to the computer-mediated nature of VT communication, could cause VT members to continue to rely on their perceptions of diversity, thereby impacting performance. It is possible that while the salience of PDD attenuates due either to physical collocation or extended contact, it continues to serve as a critical piece of contextual information for VTs and thus impacts performance. While the current study suggests these differences, our findings do not provide conclusive evidence. Future research should look to a controlled, simultaneous comparison in order to further examine how and whether VTs are affected differently by PDD and social integration.

### **Limitations**

The use of student participants raises further questions about the external validity of our findings. We feel that this does not represent a serious threat, however, as the task selected is representative of the types of tasks that might be assigned to business professionals, albeit with variation in topic. Additionally, the students in our sample were selected from a business college, and were mostly junior and senior students. This gives us some reason to believe that they are similar to their business counterparts in terms of their knowledge base, and methods for approaching problems. The use of student participants follows in the tradition of similar studies on the nature of diversity in teams, (Dahlin et al. 2005; Harrison et al. 2002; Paul et al. 2004; Phillips et al. 2006).

Another potential limitation is the possibility that the difference between treatment and control groups is due to the treatment group simply receiving information and not due to the fact that the information displayed was similar to

one's personal information. We feel this is not a serious threat, as a pilot study showed that the performance of groups receiving only dissimilar information about their team members exhibited lower social integration and performance. The same pilot study also found that groups which received all information about their team members (unmanipulated e-identity profile) exhibited outcomes which were similar to the control group which received no information. Groups which viewed all of the information in their teammates' e-identity profiles did not exhibit any significant social integration or performance gains.

A third possible limitation relates to the design of the study. Virtual teams may persist for longer periods of time than did the teams in this study. Past histories, as well as, expectations of working together in the future, may impact how team members perceive diversity. The relatively short period of time that participants worked together, as well as the brevity of the task, may limit the generalizability of this study to long-standing work teams who collaborate on a long-term task, but not necessarily to project teams. Project teams are a type of team which is brought together for a short period of time to accomplish non-repetitive tasks which typically require unique perspectives or expertise (Cohen and Bailey 1997). When the project is completed, team members return to their functional units or move on to other projects, and thus they may possess no expectation of working together in the future. It may be that our results only generalize to project teams. One potential benefit to these short-term teams is that, while exchanges between team members cannot be completely free of information which may reveal the actual diversity among team members, less time to interact reduces the opportunity for team members to reveal their deep-level differences. Future research should examine how the use of e-identity profiles impacts teams with past histories and expectations of more intense interaction. Additionally, future research might examine how time spent in interaction impacts the ability of team members to draw out particular deep-level differences. The time-limited nature of this study may have precluded team members from gaining insight into some set of specific deep-level characteristics.

Another potential limitation is that team members might have discussed their similarities or differences beyond what was provided in the e-identity profile. It is possible that the provision of the profile information may have prompted teams to discuss information in the profiles which was not related to the task, which may have affected their perception of diversity beyond that provided by the e-identity. We feel that this does not pose a serious threat due to the limited time teams had to discuss the case. Most teams were able to finish their discussion by the end of the 20 minutes, but due to the number of issues to resolve and the potentially conflicting opinions to resolve, this did not allow for much, if any, free time to discuss the e-identities. One way to address this threat, would be to analyze the contents of the teams' chat sessions, which the authors are currently in the process of doing.

### ***Practical Implications and Future Research Directions***

Harrison et al. (2002) pointed to the effect of time spent in collaboration on the development of social integration. Their study took place over the course of a semester and it was shown that team members first judge one another based on surface-level attributes, but that this is later replaced by deep-level attributes. They show that it requires a certain amount of time spent in collaboration for individuals to uncover their teammates' deep-level attributes. One of the practical implications from the current study is that our results suggest that, through use of the e-identity profiles, it is possible to form perceptions of deep-level diversity in a much shorter amount of time, thus influencing the rate at which social integration develops.

Not only can the speed of this process be influenced, we also show that the process, itself, can be changed. By showing individuals similar identity information, we influence their perception of diversity in general, deep-level attributes. Further, we found that it was possible to influence perceptions of diversity in general deep-level attributes, but not those deep-level attributes that are more relevant to the task. One explanation for this finding is that these perceptions are formed as a result of the direct experience of working with team members. Although the identity profile contained questions related to task type experience and relevant skills, individuals' direct experience working with their team members potentially overshadowed the effect of the e-identity profile. To examine this possibility, future research might measure PDD-Task both before and after teams work on the task. If the interaction term is significant before, but not after task completion, we might conclude that PDD-Task is driven by team members' observation of their teammates as they work on the task.

Our study implies that managers may be able to use e-identity profiles to influence perceptions of diversity while still retaining the positive performance benefits of multiple cognitive resources. An interesting direction for future research would be to further hone the experimental apparatus, in order to examine how the composition of the e-identity influences perceptions. It would also be important to understand how it would impact the development and use of transactive memory, shared mental models, or other team constructs.

The ability to influence perceptions of diversity has the potential to go a long way toward leveraging team composition for organizational advantage. By allowing team members who may never meet face-to-face to establish social relationships, practitioners may be able to impact VT member relationships. In enhancing social integration, practitioners might realize an increase in productivity through performance improvements and a decrease in turnover as workers become more satisfied with their team experiences.

## Conclusion

For researchers, this study has the potential to begin resolving some of the contradictory findings in the diversity literature. With regards to deep-level diversity, the results shed some light on how social integration can be improved by providing team members with knowledge of their teammates. The current study also shows that some of the findings of Harrison et al. (2002) generalize to a new and increasingly significant context – that of virtual teams, but also that there are potentially significant differences between VT and traditional team processes. Finally, it may motivate future researchers to look at the possibility of leveraging technology to influence other perceptions, such as team performance, or even social integration.

Harrison and his colleagues (2002) conclude their study with an enticing call to explore mechanisms for capitalizing on the effects of diversity. We believe we may have found one such mechanism: e-identities. It is our hope that researchers will continue to explore and expand methods for using information technology to enhance social relationships and improve the performance of virtual teams.

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