Diversity in Distributed Decision Making: An Exploratory Study

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Abstract
Diversity is defined as the differences among factors like ethnicity, gender, culture, sexuality and anything that makes two entities different from each other. Diversity creates a heterogeneous environment and is becoming an inherent part of all groups, especially virtual groups that consist of geographically distributed members. This paper studies diversity in the context of virtual groups that work together in an online environment and its effect on group performance. Instead of re-inventing the wheel, we can learn from groups used in on-line courses and extend those experiences to geographically distributed groups. The members of a typical e-learning group are different in race, gender, countries and backgrounds mimicking diversity that is often related to geographically distributed teams. A longitudinal experiment involving online classes was conducted and the results are reported. Our research revealed that diverse groups are not good for ad-hoc tasks but maybe good for on-going tasks. Future research areas are also discussed.

1. Introduction

Diversity is becoming the norm in North America and, typically, has been promoted by universities, professional societies and international organizations to reflect the changing nature of society. Diversity compliance is rooted in the human resource department, which attempts to comply with government, social and ethical norms. Many universities have specific policies regarding diversity. For example, according to the University of Oregon [50], “the concept of diversity encompasses acceptance and respect. It means understanding that each individual is unique, and recognizing our individual differences along the dimensions of race, ethnicity, gender, sexual orientation, socio-economic status, age, physical abilities, religious beliefs, political beliefs, or other ideologies.” Many universities have adopted diversity related policies.

For example, according to the University of Colorado [49], “We aspire to be a place where the quality of education is enhanced and enriched by a diverse campus community — where all students benefit from multicultural experiences...”. The Goddard College human resource policy [17] states, “Goddard is committed to creating a college representative of a diverse global community and capable of creating change. We encourage qualified candidates from groups underrepresented in our institution to apply.” Cornell University [11] has a comprehensive policy on diversity which states that, “Cornell is committed to extending its legacy of recruiting a heterogeneous faculty, student body and staff; fostering a climate that doesn't just tolerate differences but treasures them; and providing rich opportunities for learning from those differences. To that end, each of Cornell's constituent assemblies endorsed the Statement on Diversity and Inclusiveness, "Open Doors, Open Hearts, and Open Minds.”

There are many policies adopted by many institutions and businesses [16, 51]. They all have the following in common: diversity relates to individuals that think, behave and act differently, creating a heterogeneous social environment of ethnicity, race, culture, gender, sexual orientation, religion and many other factors. In some sense, diversity follows equal employment opportunity policies (http://www.eeoc.gov/) that prohibit discrimination based on age, gender, national origin and disability. While the question studied here does not relate to discrimination, it does take the same factors into account under the team context.

Diverse groups make decisions differently than homogenous groups. The nature of the task and the level of communication between members and group cohesiveness play a major part in group decision making [13,21,31,53]. We propose a score for diversity and define it at the group level and use it to study group performance over time.
The first section describes current literature on diversity, followed by a section on online learning and distributed virtual groups. The last section describes experiments and discusses results and limitations of this study.

2. Literature Survey

Modern teams reflect the changing national demographics and changing business models. Teams are becoming more diverse and geographically dispersed [26, 38]. As a result managing diversity is becoming increasingly important. Organizations must learn how to manage people of different color, race, national origin, religion and others. Researchers have used several dimensions for classifying diversity. Several researchers in business and social sciences [26, 34, etc] have categorized diversity as “visible” and “invisible” while others [25, 33,34,47] in organizational sciences have categorized diversity as “surface” and “deep”. These classifications are quite similar. Visible diversity refers to “visible” factors like race, gender, religion and nationality and invisible factors refers to “non visible” factors like skill, knowledge, sexual orientation, etc. More and more groups are becoming mirror images of the general U. S. population. The U. S. Census Bureau, Population Division [48], reports that race, gender and age diversity in U.S. population is increasing. Group diversity is real and must be studied in great detail. Cummings (2004) defines a diverse work group as one, “… in which the members, by virtue of their different organizational affiliations, roles, or positions, can expose the group to unique sources of knowledge”. It is hypothesized that if members of structurally diverse work groups engage in external knowledge sharing, their performance will improve because of this active exchange of knowledge through unique external sources”. There is an abundance of research in the areas of group working, how groups make decisions, and emerging leaders in groups [37,9,54, etc.]. It is well established that diversity brings a wealth of knowledge to the group [20,34,40,45], however, diverse group effectiveness is still a debatable issue (see [31, 36] for complete review). Many researchers [33,34,40,45] agree that diverse groups, if managed properly, can provide a positive effect. This has tremendous potential for organizations that can create distributed groups that can tap the expertise of its diverse workforce at a lower cost. However, group decision making is complicated when groups are distributed and work in a virtual environment. More studies are needed to understand diversity and performance of such groups.

Understanding decision-making in diverse teams is complex and has roots in different disciplines [1,12,32,44, 45]. Does diversity influence decision making in a positive or negative way? Mannix and Neale (2005) have linked diverse team performance to the nature of tasks. According to their report, diverse teams are appropriate for tasks involving innovation and exploration of new opportunities, while homogenous teams are more appropriate for exploitation of new opportunities. In virtual teams gender, race, culture, and social status have been identified as some of the factors affecting team outcomes [5,8,10,29]. In addition, researchers have also defined communication and, above all, trust critical [3,13,22,43] to group decision making.

There is conflicting evidence whether the diverse groups perform better than homogenous groups. According to Boiney (2001), diverse teams have been shown to generate a greater variety of ideas, draw on a greater store of tacit knowledge, make better decisions, and more effectively accomplish complex tasks than individuals'. According to Simard (2006), “… diversity is beneficial because a variety of opinions, backgrounds, and thinking styles and their integration into the solution are what contribute to better decision outcomes. According to Harris & Raskino (2007), “. . . teams with gender diversity will double their chances of exceeding performance expectations when compared to all male teams.” Kravitz (2005), however, cites several studies and concludes, "As one might expect from these incompatible theoretical perspectives and predictions, results are complex and inconclusive". Palmer (2006) summarizes the state of research on diversity and group performance, stating that “Many studies have shown diversity to impact the performance of workgroups, but the exact nature of the relationship between diversity and performance is not at all straightforward as both positive and negative correlations between diversity and performance have been found .”.

Given the current conflicting state of diversity research, it is important to continually validate existing research and add to the existing knowledge.

3. Comparison of Virtual Groups and Online Learning

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Online learning makes education available to individuals irrespective of “time” or “distance” [2]. An online education provides the most unbiased way of learning and provides a way of studying diverse group decision-making due to the asynchronous and virtual nature of education. Table 1 compares distributed virtual and e-Learning teams and summarizes the similarities between them. We have used the characteristics of students in our current webMBA program for comparison purposes.

### Table 1: Comparison of e-Learning Teams and Global Virtual Teams

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>e-learning Teams (webMBA)</th>
<th>Distributed virtual team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work on a task together</td>
<td>Work on projects together</td>
<td>Work on a task together</td>
</tr>
<tr>
<td>Diversity</td>
<td>Students from several countries</td>
<td>Team members typically from</td>
</tr>
<tr>
<td></td>
<td>• U.S.</td>
<td>• Outsourcing company (client)</td>
</tr>
<tr>
<td></td>
<td>• Europe</td>
<td>• Outsourced Company</td>
</tr>
<tr>
<td></td>
<td>• China</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• South Asia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mediterranean</td>
<td></td>
</tr>
<tr>
<td>Task</td>
<td>Structured, i.e., design a database system</td>
<td>Typically structured or unstructured</td>
</tr>
<tr>
<td>Geographically distributed</td>
<td>On line students are locally distributed with few across continents</td>
<td>maybe geographically distributed across continents</td>
</tr>
<tr>
<td>Different time zones</td>
<td>Most team members are within U.S. time zone (max difference being 5 hours)</td>
<td>Time difference may be as much as 14 hours</td>
</tr>
<tr>
<td>May include team members from different organizations</td>
<td>Include team members from different organizations</td>
<td>Typically includes team members from at least two different organizations</td>
</tr>
<tr>
<td>Different language</td>
<td>English</td>
<td>English, though possible to have communications in different language within a group</td>
</tr>
<tr>
<td>Socially different strata</td>
<td>Possible, but has no affect in on-line classroom projects</td>
<td>Possible and could hinder communication</td>
</tr>
<tr>
<td>Motivation</td>
<td>Get good grades</td>
<td>Complete contract</td>
</tr>
<tr>
<td>Team Composition</td>
<td>Working students with varying backgrounds</td>
<td>Professionals with varying backgrounds</td>
</tr>
</tbody>
</table>

As is evident from Table 1, both the e-learning and distributed teams operate in a similar environment implying that e-learning teams can be used as a surrogate for virtual group in a distributed environment. In many ways, geographically distributed teams mirror the teams in on-line courses. Students are also physically dispersed, perhaps in different time zones, have different ethnic, race, cultural and national backgrounds, and work in a group to achieve certain goals. Many authors have successfully used students as a surrogate for their experiments [8,21,39,52,53], and we also used webMBA students for our experiment.

### 4. The Proposed Model

Many researchers [8,30,32,53] have suggested model(s) to study the impact of contextual variables in learning environments. We have modified their
model to include several surface variables that reflect diversity in the online learning environment (see Figure 1)

Figure 1: Diversity model

4.1 Group Diversity Score

There are many dimensions of diversity, as previously stated, but we have restricted this experiment to three “surface” or “visible” factors: gender, race and national origin. The Group diversity score can be extended to others factors, as needed. Also, no attempt is made to address the ‘density’ of a sub-group within a group. For example, a group with two females was considered to have the same diversity as the group with one female in terms of gender diversity.

Next, we define diversity at the group level.

Race diversity score is defined as the number of different races represented in the group.

Gender score is defined as the number of different genders represented in the group.

National diversity score is defined as the number of different nationalities represented in the group. No distinction was made among non-US citizens.

Group diversity score (GDS), then, is defined as a function of the above three scores.

\[ \text{GDS} = f(\text{race score, gender score and national origin score}) \]

The GDS score is defined at the group level and used to study the effect of a diverse group on performance. Our unit of analysis is “group” as opposed to “individual”, and “multi-level” as opposed to “single”. Many previous studies [4,7,14,19,28,38,46] have examined the impact of a single factor (race, nationality, gender, race, etc.) on groups. We go a step further and discuss the impact of multi-surface factors on group performance.

4.2 Group Performance:

Group performance was measured as the score received by each group on the assignment. Peer evaluation was used to study an individual’s contribution and their satisfaction with the group. For experimental purposes, however, no distinction was made among individual assignment scores or contribution of each group member on the assignment.

5. Research Hypotheses

The following research hypotheses were developed.
5.1 The “Pessimist” and “Optimist” view

Kravitz, (2005) summarized the state of research on diversity, stating, “As one might expect from these incompatible theoretical perspectives and predictions, results are complex and inconsistent. Some types of diversity (e.g., race, gender, and age) are more likely to have negative effects, whereas other types of diversity (e.g., functional background, personality) are more likely to have positive effects, at least when the group process is controlled”. However, Kravtiz also noted the optimist view, which “…focuses on diverse teams’ access to a variety of resources that, if properly exploited, should enhance performance. This work tends to look at functional diversity, which serves as a proxy for diversity in knowledge, skills, information, and expertise. Information processing provides the theoretical basis”.

As is evident from the research, there are conflicting studies related to the effect of diversity on group decision making [31]. We are taking the optimist view, supported by some researchers in one form or the other [7,20,27 etc.], in developing our hypothesis that surface level diversity affects group performance.

Accordingly, our first hypothesis is:

H1: Does the level of diversity affect group performance?

In addition, we wanted to study if diverse perform better than non-diverse groups. We developed the following hypothesis to study performance among diverse groups.

H2: Does a diverse group perform better than non-(less) diverse group?

5.2 The Trust and Cohesion Issues

The next question relates to group performance over time. Several authors [3,13,22,23,24,42,43] have discussed the “trust” factor among groups. Interpersonal trust [15,18,35,43] and cohesion [21,52] play important roles in group communications. Gundry (2000) noted, “...in virtual teams, where we are consciously and unconsciously working hard to sense the level of trust (predictable trustworthiness) that we can place in our remote fellow members in order that we feel comfortable in collaborating with them.”

Legitimate communication on the forum provided insights on trust and cohesion among group members. Several comments unrelated to the project were noticed in the forum. Many group members posted messages of a personal nature, which demonstrated the increased trust among group members. Almost 85 percent felt that their group members rated them fairly in peer evaluation and they would work with the group again, implying trust among group members. In addition, 85% stated their group was cohesive and group dynamics worked well. These results are consistent with diverse groups that exhibit cohesion and trust, as Rolf et al. (2008) reported, “...group identification is positively related to students' desire to stay in their groups...”. Based on our experience, group members start trusting other members over time indicating increasing level of trust and cohesion. We expect as groups begin to understand and accept diversity the trust increases and group’s performance improves over time, hence the following hypothesis was developed.

H3: Does the level of diversity affect group performance over time?

A related hypothesis was developed to test performance differences due to diversity over time

H4: Do diverse groups perform better than non-(less) diverse group over time?

6. Research Design

The present study was conducted at an urban public university in the Mid-Atlantic area. The university is an upper-division university and has a diverse, non-traditional, commuter student population. The model in Figure 1 was used to assess a diverse group’s outcome in an online course in the webMBA program. The first management information system (MIS) course in the MBA was selected for the experiment, which is required and typically the first course many students take. This course was selected since it requires extensive group work.

As previously mentioned, three diversity surface factors - race, gender and nationality - were used for this experiment. Diversity in the context of race was defined as the number of different races represented in a group. For example, if a group has
all members of the same race, then the diversity was given a score of one. On the other hand, if a group has three different races, a score of “3” was assigned. Same logic was used for gender and nationality. A composite group diversity score was calculated based on the number of different diversities in a group. The higher the score, the more diversity the group had.

Regression analysis was used to test hypotheses one and three, and independent mean comparison was used to test differences among group performances for hypotheses two and four.

Group Project score = f(diversity score)

The next section discusses the experiment.

6.1 The Experiment

The experiment was conducted over two semesters (Fall 05 and Fall 06) with a total of 49 students in the two classes. For group assignments, classes were divided into groups of three or four students, based on their past experience and familiarity with the subject matter to provide parity among groups. There were thirteen groups in the course. Over the semester each group worked on two projects and individual grades were based on overall project grade adjusted for peer evaluation. Both tasks were structured in nature and required intense group communication. Tasks in both assignments were kept similar to remove the effect of tasks on group performance. The first task involved designing a budget using a spreadsheet, and the second task involved developing a database using database software. Students were provided training for the spreadsheet and database software used in the projects. Both projects included several topics requiring extensive group discussions in the group conference area. Only group members and the instructor had access to the group area. Instructor did not intervene in group discussion and all clarifications were provided via e-mail.

Tables 2(a) and 2(b) provide the group diversity scores and distribution for each group.

<table>
<thead>
<tr>
<th>Class/Group</th>
<th>Diversity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
</tr>
<tr>
<td>E</td>
<td>6</td>
</tr>
<tr>
<td>F</td>
<td>6</td>
</tr>
<tr>
<td>G</td>
<td>4</td>
</tr>
<tr>
<td>H</td>
<td>6</td>
</tr>
<tr>
<td>I</td>
<td>7</td>
</tr>
<tr>
<td>J</td>
<td>6</td>
</tr>
<tr>
<td>K</td>
<td>5</td>
</tr>
<tr>
<td>L</td>
<td>5</td>
</tr>
<tr>
<td>M</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 2 (a): Diversity Score among Virtual Groups

<table>
<thead>
<tr>
<th>Diversity Score</th>
<th>Number of Groups</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>46</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 2(b) cumulative Diversity among virtual Groups

As noted from Tables 2(a) and 2(b), diversity scores range from 4 to 7 and almost 46 percent of the groups have diversity score of 6 or more. This is the score we used to study differences in group performances (hypotheses two and four) due to diversity.

The next section discusses results.

7. Results & Discussion

A regression analysis was used to test the impact of diversity on group performance. SPSS software was used for analysis. Tables 3(a) and 3(b) summarize the result of group performance on project one.
The second hypothesis was tested by dividing the group into two, one with a diversity score of <6 and the other with a diversity score of 6 or more than 6. Tables 4(a) and 4(b) summarize the results of comparison of means for Hypothesis 2.

As seen in Tables 3(a) and 3(b), diversity does not affect group performance at .05 or even at .01 level of significance. Also, Tables 4(a) and 4(b) show no difference in the performance, for groups with different diversity levels; hence, both Hypotheses One and Two are rejected. These results are consistent with the ‘pessimist” view reported by several researchers [6,31,47, etc..]. These researchers view is summarized by Kravitz (2005) as, “ The pessimistic view concentrates on affective problems, as predicted by the similarity–attraction paradigm (birds of a feather really do flock together) and by social-categorization and social-identity theories (with the resulting distinction between in-group and out-group). This work typically defines diversity in terms of tenure and social categories such as race and sex.”

Hypotheses Three and Four were also tested using SPSS. As already stated, the group scores on project two should reflect trust and cohesion resulting from working together on project one. This should result in improved performance for diverse groups as compared to less (non) diverse groups. Tables 5(a) and 5(b) summarize the results for hypothesis three.
Levene’s Test for Equality of Variances

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>2.032</td>
</tr>
<tr>
<td>2.998</td>
</tr>
</tbody>
</table>

Table 6(b): Independent Samples Test

Tables 5(a) and 5(b) show that the level of diversity does impact group performance and Tables 6(a) and 6(b) support the hypothesis that diverse groups tend to perform better than non-diverse groups over time. Both Hypotheses 3 and 4 were accepted at $\alpha = .05$ (note: hypothesis four is a directional hypothesis). These results are consistent with researchers who have supported the trust factor impact on group performance [3,37]. There appears to be support for the hypothesis that groups do develop trust and cohesion and, that diverse groups tend to perform better than less diverse groups over time.

The experiment raises some interesting questions of group development over time and how diversity can be a positive factor in group decision making. However, the question still remains: should managers create less or more diverse groups? The results, though not conclusive, have implications for managers and may provide some guidance on this issue. Our research indicates that surface diversity has no impact on group performance in the short run, but in the long run diverse groups may perform better than less diverse groups. This would imply diverse groups are not good for ad-hoc tasks but might be good for on-going tasks.

### 8. Limitations

As with any study, the results should be interpreted with caution. The study has several limitations, including the sample size and needs to be replicated and validated. In this experiment, group size was not considered and it is possible results may differ if it was a factor. We only considered U.S. and non-U.S., as a nationality factor, and this may hide differences among non-US students. While we removed the effect of the task, it’s possible that groups tend to perform better over time only for certain tasks. The diversity index may have to be revised if groups behave differently due to diversity ‘density’ within a group (i.e., 2 females vs. one female in a group). We are continuing our efforts in this direction by extending this exploratory experiment to include different nationalities, studying the affect of group size and by changing the nature of task.

### 9. Future Research

There are many interesting research areas related to diversity and distributed groups. Future research could build upon existing research by replicating it over time across different groups and group sizes. Also, it may be desirable to have a wider range of diversity; i.e., groups with minimum diversity and groups with maximum diversity. This would help to further validate the experiment. In addition, this experiment should be replicated with different group sizes to study the impact of size and diversity on group performance. It may be desirable to include other forms of surface diversity like age, religion, etc., to study their effect on group performance. Another important area of interest would be to change the nature of the task from structured to semi-structured and to study diversity’s impact on group performance. As long as research produces mixed results, there will be a continuous need for validation and replication of experiments.

### 10. Conclusions

This study provides an important step with the development of a group diversity level measure based on multiple surface level factors for studying the impact of group diversity on group performance. The study confirms the existing literature’s pessimistic view that diverse groups do not perform better. However, the experiment also revealed that diverse groups develop trust and may perform better than less diverse groups over time. This could be beneficial to managers who are
creating diverse groups either by choice or out of necessity.

Diversity is a fact of life, be it gender, race, nationality or any such factor. It is becoming the norm as organizations outsource work and the teams become geographically distributed. It is necessary to study the interaction of a diverse distributed group and its impact on problem solving. This exploratory paper is an attempt in that direction.

10. References


[50] University of Oregon, Definition of Diversity, [http://gladstone.uoregon.edu/~asuomca/diversityinit/definition.html](http://gladstone.uoregon.edu/~asuomca/diversityinit/definition.html)


