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Exploring Prior Work History within Software Project Teams

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ABSTRACT

Software project management is challenging not only due to the technical requirements associated with creating software, but also in dealing with interpersonal issues that arise during the course of a project. One interpersonal dynamic within software project teams that is rarely discussed is the interaction among the team members themselves. Using social identity theory as a lens, this research explores how subgroups based on individuals' prior work history could impact the project team. These prior working relationships could be a benefit to the team, or alternatively, could create favoritism among some members of the team. We explore the phenomenon of how prior work history affects the project team's dynamic in the context of a massive multiplayer online role playing game (MMORPG). Using the results, we offer suggestions for future research and practice to consider the impact of social identity within software project teams.

Keywords

Software project teams, team dynamics, social identity theory.

INTRODUCTION

Software project teams are comprised of group members that must work together to accomplish tasks for the sake of the greater goal of the project. Challenges arise when conflict negatively impacts a team's ability to complete tasks effectively (Kankanhalli et al. 2006). When dysfunctional conflict occurs within teams, it becomes increasingly difficult for project managers to manage projects effectively.

Dysfunctional conflict may occur as individuals categorize themselves into different groups. For example, individuals may find an affinity for other individuals in the project team that perform similar types of work, have a similar background, or with whom they have a prior history of working together. As individuals within a project team develop a sense of who they are, based on their relationships with fellow team members, their perception of themselves and the social groups within the team can negatively or positively impact the project team's processes (Adams and Anantatmula 2010). When individuals identify strongly with a group, this can create feelings of favoritism towards others in the group and discrimination towards others that are not group members (Turner 1975).

Using the lens of social identity theory, the objective of this study is to explore how teams might be impacted when some of the team members have history or working together on past projects. We explain how we explored this issue in the context of a massively multiplayer online role playing game and how we can use these findings to identify opportunities for future research in software project management.

THEORETICAL BACKGROUND

Social Identity Theory

Humans naturally classify and categorize the world around them, and this is also consistent with how individuals view themselves. Individuals create a sense of social identity by defining oneself based on membership in a social group (Tajfel and Tuner 1979). Social identity theory examines the reasons why individuals in one group (i.e., an in-group) discriminate against members in another group (i.e., an out-group). Conflict typically occurs within a group when there are scarce resources, which promote competition among team members (Campbell 1965); however, individuals may feel a preference towards members of their own group without any competition, even when there are no monetary rewards or no need to complete a task (Turner 1975).

Social identity theory assumes that a) individuals want to view themselves positively; b) individuals believe that being a part of a social group can be perceived positively or negatively; and c) one examines if their social group is contributing positively or negatively to their sense of self-esteem by comparing their current group to other groups (Tajfel and Tuner 1979).

Social identity theory informs us that during intense times of conflicts, individuals will not engage as individuals, *per se,* but will rather act as a member of a group (Turner 1975). If a group feels threatened or devalued, the group responds defensively (van Knippenberg 1984). However, this group rivalry does not occur unless individuals begin to compare themselves to another group (Tajfel and Tuner 1979).

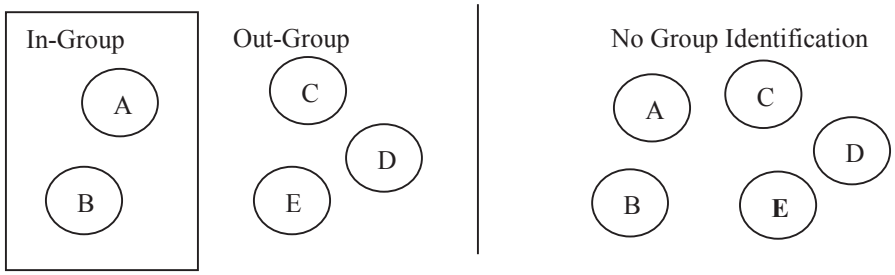
While social identity theory explains how groups respond to conflict, there are also benefits to having a strong social identity in organizations. When a group has a strong social identity, it improves the team members' commitment for the organization, creates a sense of group norms so the group behaves as one unit, and improves group cohesion, cooperation, and perceptions of the group (Ashforth and Mael 1989). Therefore, social identity can be something that can create conflict or can mitigate conflict, depending on how one's social identity is formed.

Social Identity in Software Project Teams

Within a software project, it is possible for individual team members to categorize themselves into subgroups. The categorization of subgroups may be based on the type of work that they do (programmers versus quality assurance), status (managerial titles versus non-managerial titles), or department (Ashforth and Mael 1989). When groups are formed within a project team, those that view themselves similarly (e.g., programmers) would consider themselves as an "in-group" and all others on the team (e.g., non-programmers) would be perceived as an "out-group."

Another categorization that could establish social identity is one's prior work history with other individuals on the team. Individuals that had a positive joint work experience or project outcome would be more likely to view selves as a group, creating a sense of social identity. However, if the prior work history was not positive, then individuals may distance themselves from the in-group with a shared work history (Jackall 1978).

When individuals are assigned to work on a software project team, it may not be immediately known who has a prior history of working together on past projects. To any individual that does not have a prior work history with others on the team, that individual may not perceive an in-group versus an out-group. Figure 1 demonstrates how individuals may perceive the same software project team based on their work history. Panel 1 demonstrates how individuals with a prior work history (e.g., Person A or B) would perceive an in-group and an out-group. Panel 2 demonstrates how all other individuals without a prior work history (e.g., Person C, D, or E) would likely the view the same team as a unit with no subgroups.



Panel 1: Perception of team by individuals with prior work history

Panel 2: Perception of team by individuals with no prior work history

Figure 1: Varying Perceptions of Software Project Team based on Social Identity

Collective action, or joint actions as a group, can be explained and predicted based on one's social identity (van Zomeren et al. 2008) which can alter the software project team's dynamic and how individuals work together within the group. Within a project team, newcomers (Persons C, D, or E above) may seek to create a sense of self within

the group (Ashforth and Mael 1989). People want to compare their beliefs with others that are similar to them (Festinger 1954), so it is normal for newcomers to take a position similar to the in-group (Ashforth and Mael 1989). Within a project team, members of the in-group could set the norms for the group because they would be a "united front," so to speak. However, members of the out-group (without even knowing that there is an in-group or an out-group) could feel like they should go along with the in-group in the interest of being a part of the larger group. Those that have had a negative prior work history may choose to disassociate with the in-group (e.g., Person C in Panel 1) or view themselves as an individual rather than a group (e.g., Panel 2). Given that social identity can negatively or positively impact the team's dynamic, there is the potential to identify how social identity theory may help to provide different insights into project team dynamics.

RESEARCH STUDY

In this exploratory study, we took a field study approach to investigate project teams in action. A Massively Multiplayer Online Role Playing Game (MMORPG) provided the context for our investigation. In MMORPGs, players develop avatars to represent themselves as they play the game to acquire resources and to accomplish goals. While it is possible to play MMORPGs alone, many individuals work in teams alongside both known and unknown players.

In many MMORPGs, players can choose to participate in a league. A league allows individuals to choose to associate themselves with a certain people that play the game. An individual may know their league members in real life or only through the game. If a person chooses to play in a league, it is possible to complete quests within the game a) alone with no members of their league; b) only with members of their league; or c) with some members of their league and with other players that are not part of their league. Individuals that do not wish to participate in a league are able to play alone and work in ad hoc groups to complete quests.

Field Study Setting

We examined team interaction within an MMORPG quest. A quest is completed by five individuals working together to accomplish a series of tasks. In the quest, the team has a shared goal to complete the quest, but each individual has their own desire to acquire resources for personal needs, improve player statistics, or gain experience points to increase skill or standing within the game. Individuals can join a quest with fellow league members or may choose to complete the quest with strangers within the game as an online ad hoc team.

In a quest, each player adopts one of the following roles:

- Soldier – Three people within the team have the role of attacking and destroying computer-generated enemies within the quest. The soldier's job is to defeat these enemies (often appearing in large groups or mobs) to complete the quest and acquire resources.
- Medic – One person that restores fellow team members that received damage during enemy attacks by healing them or resurrecting them should the team member's avatar die during an enemy encounter.
- Captain – One person that serves as the primary target for the adversaries. The computer-generated enemies try to prevent the team from accomplishing tasks within the quest. The goal of the captain is to draw enemy attacks to allow the soldiers to effectively attack the opponents. The captain tends to set the pace for the team members to complete tasks.

Field Study Task

To collect data, we solicited an individual outside of the research team to play as a confederate using a specific protocol. The confederate was an individual with a high level of expertise, having over three years experience and having reached the highest skill levels in the game with multiple characters.[1]

To develop the protocol for data collection, one of the researchers observed the confederate play several quests. There were multiple discussions between the researcher and the confederate as to how to best observe team dynamics in this context. We tested a variety of manipulations to ensure we had a behavior that could impact the norms of the team that was strong enough to potentially elicit a response from team members. Through these

[1] Within this MMORPG, an individual may have more than one character.

discussions among the researcher and the confederate, to explore team dynamics which may be impacted by social identity, the confederate did not play as a member of a league and would encourage the team to alter its pace in the completion of tasks. This is a behavior which the confederate had observed in his prior gameplay and could be viewed as either a negative or positive change to the group norms depending on each team member's needs. Therefore, this task explores how team members respond when a non-group member proposes to alter the team's interaction during the project.

The completion of all of the tasks within a quest typically requires 30-60 minutes to complete with several milestones that must be completed within each quest. To provide additional rigor to the study design, more consistent with a field experiment, the confederate played the quest as he normally would (when he played on his own, not engaged as a confederate) until the completion of the first milestone within the quest. Immediately after this milestone, the confederate announced to the group "have to move this along i got to run soon." The confederate then proceeded through the quest as quickly as possible to alter the pace of the team and would do his best to encourage his fellow team members to progress through the quest quickly.[2]

This change in pace was an attempt to alter the team's norms to elicit a response. If one or more team members moves ahead too quickly through the quest, other team members may not have enough time to replenish their resources to complete their tasks, particularly if they are less skilled in the game. However, there could be team members that would prefer a quicker pace due to their own personal time constraints. An analogy in an organizational context could be if an individual within a team wants to quicken the pace of a project irrespective other team members' needs or preferences. The request made by the confederate to quicken the pace of the quest could elicit either a negative response or a positive response from fellow team members depending on each team member's personal goals.

Relationship between Task and Software Projects

To demonstrate how an MMORPG may serve as analog to a software development project, Table 1 compares the setting of a MMORPG quest to an agile software project across multiple dimensions.

Characteristic	Agile Software Project	MMORPG Quest
Objective	Team members work together to complete a series of tasks while simultaneously balancing constraints on time and resources	
Team Size	Can vary dramatically, but often use smaller teams with nine or less individuals	Five individuals
Role Assignment	Self-organized teams in which individuals select their role	Individuals identify one of three roles that they would like to have during the quest
Length of Project	Typically weeks or months	Approximately an hour
Collective Goal	Seek to collectively complete the project based on the customer's needs and available resources	Seek to accomplish primary objective of the quest
Personal Goals	Acquire new skills, knowledge, or contacts	Acquiring resources and/or new skills
Leadership	Facilitating role, such as a scrum master	Facilitating role, such as the captain to help set the pace

Table 1: Comparison of Software Projects and Study Context

As noted in Table 1, there are several dimensions in which there are similarities between an agile software development project and an MMORPG quest. Certain aspects of agile software projects are more alike than different from an MMORPG quest, such as small team size, use of a facilitator as a leader rather than a manager, and a mix of personal and collective goals within the project.

Although not a complete analog to the workplace (Schultze et al. 2008), as a research setting, the MMORPG environment has the potential to provide insight into organizational and group-level phenomenon (Assmann et al.

[2] As a soldier, the confederate had little to no influence to encourage the team to proceed through tasks more quickly. Therefore, his primary mechanism to encourage a faster pace was repeat his request to quicken the pace.

2010). MMORPGs can serve as a venue for exploratory research to explore issues to be further studied in organizational settings. Another benefit of using MMORPGs as a research setting is the ability to study a phenomenon by embedding a confederate to study team dynamics. MMORPGs also contain objective data and allow recording of chat conversations and events, which allowed for team members' reactions and activities to be examined in detail.

Data Collection

During each quest, we recorded the avatar names of the other team members as well as chat logs and event logs. We visited a third-party website and identified each avatar's progress within the game, including history of completing quests, and league membership. The chat logs recorded all public conversations within the quest among the players. The event log recorded major events, such as if a team member's avatar died during the quest or if players left or entered the quest during game play.

All chat and event logs were reviewed with the confederate within 24 hours of completing each quest, with most logs being reviewed with the confederate within 4 hours of him completing each quest. This review allowed the confederate to explain the context of the activities that were recorded in the chat log and event log. Further, the confederate would take notes after each quest giving his opinion as a player of the game as to how well the team worked together to complete the tasks within each quest.

The confederate played thirty quests in the role of a soldier as described above. Three people on the team play as a soldier (including the confederate), making the position generic and easy to replace on the team. On a project team, this role would be the equivalent of someone with a generic skill set that is easy to replace should the team member leave the project.[3]

Data Analysis

We analyzed the data by carefully reading the chat logs and event logs. One researcher would also speak with the confederate about quests to gain additional insight not provided by the chat and event logs.

Each event and chat log was coded to identify reactions to the confederate's request to quicken the pace of the team as well as if the reaction was positive or negative. The chat and event logs also enabled us to identify the severity of the reaction as well as how quickly each individual reacted (if at all) to the confederate's request to speed up the pace of the game. This data was triangulated with the information provided by the confederate at the end of each quest to ensure we had a complete understanding of the team dynamic.

For each team member in a particular quest, we used chat and event logs to record the number of times an individual supported or discouraged the confederate's request to quicken the pace, a code to represent the nature of support or discouragement, and if the individual was part of a league or not. Further, since all activities recorded in the chat and event logs have a timestamp, we could also identify the length of time that it took for a person to express support or displeasure about the confederate's request. We compared the reactions of non-league members with league members. We also examined team dynamics among teams with no league members and those with two or more league members. This allowed us to use both qualitative and quantitative data to examine how league members and non-league members reacted to the confederate's requests to alter the pace of the quest.

RESULTS

We were unable to control for whether or not the confederate would be able to play a quest with members of a league. Once the quest was completed, it was possible to identity if the fellow players were part of a league or not. In some quests, the confederate had a suspicion that some team members knew one another, but this was rarely confirmed during the quest. This is analogous to software projects in that it is not always obvious at the onset if individuals have had a prior working history.

[3] The confederate also completed thirty quests as a captain to compare how team members would respond to someone in a different role making the request; however, length constraints for this workshop prevent us from discussing those results in this paper.

Eleven of the thirty teams had members in leagues, with nine groups having two league members, one group having three league members, and one group having four league members.

We expected that it could be likely that individuals that play in leagues would be more skilled than individuals that do not play in a league. Individuals in leagues have a strong desire to play the game and are part of a larger group, suggesting that they may be more invested in playing the game more than others. However, individuals that played in leagues had only a slightly higher skill level than those individuals that were not part of a league (no significant difference in skill level for league versus non-league players using a t-test).

Individuals that were playing with league members were more likely to express a negative opinion of the confederate's urging to speed up the pace of the quest than non-league members. Further, league members expressed their discontent with this strategy more quickly than individuals that were not part of a league. In one scenario in which three of the team members were league members, only the confederate spoke publicly. The first record of any conversation in the public chat log occurred when the confederate asked to quicken the pace. When there was no response, the confederate pushed the team again to move along quickly. The *only* item in the chat log from any team member other than the confederate was a league member, who responded negatively in an attempt to silence the confederate.

> 13:24:20 [Confederate]: *have to move this along i have to run soon*
> 13:26:40 [Confederate]: *lets gogogo*
> 13:26:51 [Medic-League Member]: *shut up dude*

In another quest, when the confederate proposed altering the pace of the group, teams that had members from a league were sometimes quite harsh in their response to the confederate. In a quest, members could vote to eliminate someone from the group with a majority vote (i.e., 3 out of 5 agreeing to remove a player). In one quest, the confederate kept pushing the group to move faster. In this quest, a captain and soldier entered the quest together. When the confederate stated a need to quicken the pace of the quest, the response from a soldier was sarcastic.

> 10:28:08 [Confederate]: *have to move this along i have to run soon*
> 10:28:23 [Soldier – League Member]: *ah yeah we'll cater to a [soldier]*

In this same scenario, the confederate kept prodding the group to move quickly. However, after a fifth request to quicken the pace by stating "last one lets gogogo," the group expelled the confederate from the team just before the final task. The confederate felt like he was being punished so he would not receive any rewards by completing the quest with the team.

In another scenario, the confederate stated his need to move things quickly. Five minutes later, things had slowed to their original pace after a soldier that was not part of a league made a mistake. After stating "lets go go go" with no verbal response and following up two minutes later with "come on guys whats the hold up", the confederate was expelled by the group only halfway through the quest.

Occasionally, fellow team members would support the idea of speeding up the pace of the game. Those in leagues were less likely to agree with the idea to quicken the pace of the group, but if someone in the league was positive about the idea, then they responded very quickly to affirm their agreement with the idea (more quickly than non-league players). In one quest, the confederate kept prompting the group to speed up the pace; the captain, part of a league with another soldier, shared ways to avoid enemies to proceed through the quest more quickly.

DISCUSSION

This study explores team dynamics within a project team in which some of the team members have a prior history of working together using the lens of social identity theory. Given that was an exploratory study, the goal was not to prove or disprove social identity theory, but rather explore how team dynamics might be affected using the lens of social identity theory when some team members had a prior work history.

For those with a prior work history, social identity theory predicts that members of a group would have a desire (and often pressure) to respond as a group (van Zomeren et al. 2008). Further, social identity theory would state that there would be a tendency to distrust outsiders, particularly if they try to disrupt the group (van Knippenberg 1984).

When the confederate expressed a desire to change the pace of the game, and in particular, when he did so multiple times in an effort to effect change, there was a swift reaction by league members to suppress this behavior of the confederate as compared to scenarios in which there were no league players. Meaning, those with a prior work history (as league players) were quicker to respond negatively to the situation than non-league players.

When league members responded together as a force to verbally criticize the confederate or expel him from the quest, non-league players may not have realized that a subgroup of league players existed within the larger team. As soon as multiple team members seemed to be in agreement, social identity theory suggests there would be pressure to conform to the group in the treatment of the confederate (Ashforth and Mael 1989).

Potential for Future Research

In most software projects, the interpersonal dynamics within the software project team have the potential to impact the outcomes of the project. Yet, with the proliferation of agile software development methods, the interaction and interdependence among team members increases. We have little research in the software project management domain that explores dynamics within software project management teams and the impact of the team's dynamic on the project. Prior research has also suggested that rather than defining roles for each team members, individuals should be allowed to self-organize (Rogers and Lea 2005). Given that agile software development methods tend to rely on the principle of self-organizing teams, it would be interesting to examine how social identity in agile teams varies from software project teams that use traditional or waterfall development approaches.

Social identity theory is rarely used in the information systems or software project management literature with the exception of discussion of national or organizational culture (Gallivan and Srite 2005; Hwang 2005; Straub et al. 2002). National culture (Straub et al. 2002; Hwang 2005), organizational culture (Gallivan and Srite 2005), and other demographic variables such as gender (Kankanhalli et al. 2006) can affect how one defines themselves within a group. Yet, this study offers alternative reasons to establish social identity, such as prior working history with a team member. Future research could explore in a software project context how individuals create their social identity, which is usually based on membership of multiple social groups (Straub et al. 2002; Gallivan and Srite 2005).

Future research could also consider how social identity based on prior work history impacts groups based on their stage of development. For example, using Tuckman's (1965) stages of group development, forming, storming, norming, and performing, researchers could consider the positive and negative impacts of social identity within the project team based on the stage of team development. Tuckman's research has been criticized for failing to consider the impact of social identity (Lembke and Wilson 1998); however, the impact of social identity on team dynamics could be useful in understanding software project team dynamics. The manner in which social identity is developed among members of a team is likely to have its beginnings in the forming stage. Social identity theory has the potential to explain storming within a team (i.e., conflicts) and explain the development of team norms (i.e., team behaviors) (Hogg and Reid 2006).

Most studies that examine social identity theory examine this phenomenon based on face-to-face interaction; however, social identity has been observed in distributed groups that leverage technology for interaction (Rogers and Lea 2005). Future research should continue to explore the role of social identity in both traditional, face-to-face software project teams and distributed project teams and could examine if social identity is developed differently based on the interaction of the group.

Considerations for Practice

When staffing a software development team, some project managers may seek out individuals with a successful joint work history with other members of the project team. Social identity theory suggests that individuals' self-categorizations into subgroups could impact the team's dynamic. Individuals categorize themselves into groups for nominal reasons. Project managers should consider how such self-categorization (based on prior work history, among others) could impact the team. In staffing software project teams, it is important for managers to be aware of how strong cultures, language, and national heritage can influence creation of subgroups, which can subsequently lead to conflict (Kankanhalli et al. 2006). A further concern that can occur when individuals within a team develop a social identity based on a subgroup within the team is that out-group team members feel pressured to engage with the team in a certain way.

We are not recommending that project managers avoid staffing individuals with a prior work history on the same project, but rather that managers should recognize that there could be both intended and unintended consequences to this choice. Therefore, software project managers may want to seek out approaches to help the group create a social identity as an entire project team, rather than as subgroups within the team. Shared social identity creates a stronger level of commitment to the team which can reduce conflict (Mortensen and Hinds 2001); therefore, if all team members in the project team view themselves as a single group, rather than subgroups, there is the potential to reap the positive benefits of social identity, such as group cohesion, less conflict, and higher levels of *esprit de corps* (Ashforth and Mael 1989).

CONCLUSION

This study was an exploratory effort to examine if prior working relationships has an impact on project team dynamics. Given that prior research typically assumes that prior work history can be a positive attribute within a team, this study offers an alternative perspective. Few studies examine social identity in the context of software projects. Research has found that project workers have develop a sense of identity with their organization and their profession (Dwivedula and Bredillet 2010); however, the growth of agile methods and interdependence among team members makes this theoretical lens ripe for additional study. While we have research that examines interactions across other project team stakeholders, such as project managers and project sponsors (Krane et al. 2012) or project managers and executives (Keil et al. 2014), we have little research examining the interpersonal dynamics within software project teams. By looking inward at the dynamics within the software project team, we have potential to examine and address additional issues that can positively or negatively impact software project management.

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