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HOW TO COMPOSE FLUID TEAMS AS NATURAL BORN COORDINATORS
- AN AGENT-BASED MODELLING APPROACH

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ABSTRACT
This study applies an agent-based modeling approach to explore how team composition impacts teams’ ability to coordinate. The modeler can explore (1) how the teams’ average rate of behavioral adaptation impacts teams’ ability to coordinate and (2) how the distribution of rates of adaptation within the teams impacts teams’ ability to coordinate. The results from a series of experiments suggest that homogenous teams with moderate rates of adaptation outperform both teams with high rates - and teams with low rates of behavioral adaptation. The results further suggest that intra-team heterogeneity in most cases is detrimental to teams’ ability to coordinate. Discussions of the findings, the contribution to theory, the managerial implications, the limitations, and suggestions for future research finalize the paper.

Keywords: team composition; team coordination; mutual adjustment; adaptation; agent-based model

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1. INTRODUCTION

For a long time teams have proliferated in organizations as a preferred way of organizing work that requires joint effort and diversity with respect to knowledge and skills and today firms apply teams to a larger extent than ever before. According to Hollenbeck et al. (2012) firms have shown a steady increase in the use of team based structures over the last decades. Interest in team-based research has also grown as a response to the increased use of teams in organizations (Davison et al., 2012). In addition to the increased use of team based structures researchers have reported recent changes in the way today’s organizations apply teams. Tannenbaum et al. (2012) noted that teams in organizations have changed from being fairly stable to be much more fluid e.g. in professional service firms tasked with jobs in accounting, marketing, engineering, law, information technology, and consulting. Within these organizations teams are often temporary with quickly changes in team membership. Other examples of temporary teams that are quickly formed to complete a team task are medical trauma teams (Klein et al., 2006), product development teams (Edmondson & Nembhard, 2009), and computer software teams (Huckman et al., 2009). In such settings individuals are often part of a resource pool in possession of specialized knowledge on an adequate high level. The organization can draw team members from this pool and compose teams that are able to work together in order to meet the needs of a pressing task that requires complementary expertise and high levels of specialization. Edmondson (2012) reports on the phenomenon of temporary teams by the verb, “teaming” as the gathering of experts in temporary groups to solve problems they’re encountering and then move on to address other cases. According to Edmondson today’s organizations face a quicker speed of change, more intensity of market competition, and unpredictability of customers’ needs. As a consequence there is often not enough time to build stable teams and organizations must increasingly compose teams on the fly when needed.

It is well recognized in the team literature that coordination and integration of team members’ contribution is an important process that is related to team effectiveness and performance (e.g. Brannick et al., 1993; Ilgen et al., 2005; Kozlowski & Bell, 2003). Some scholars have proposed that team coordination becomes more difficult when teams are cross functional with different specialized knowledge that they must combine to solve the team task (Majchrzak et al., 2012). It has also been suggested that the challenge of team coordination is more severe in temporary teams because their members lack common experiences in learning from each other (Tucker et al., 2007), may lack team psychological safety (Edmondson, 1999) and they have not developed transactive memory systems that could facilitate coordination, as they lack a common history of working together (Reagans et al., 2005).

Given that (1) teams are on the rise, (2) coordination is an important process for achieving effectiveness in teamwork, (3) team members often bring deep and specialized knowledge to the teams task, and (4) teams are becoming more fluid lacking a shared history of working together, it follows that today’s organizations increasingly face the challenge of composing teams that are capable of coordination from the very first time they are gathered as a team. In other words: today’s organizations face the challenge of composing teams that are “natural born coordinators”. As will become evident in the literature review in the subsequent sections research has so far neglected this important and topical challenge. This seems quite remarkable, as the importance of team coordination is well recognized in various literatures. The literature on team coordination has so far neglected team composition as an antecedent of team coordination and research on team composition has not considered coordination as an
outcome of team composition. This means that we currently lack answers to questions such as this: will teams coordinate better if they are composed of similar - or dis-similar members?

This study aims at contributing to the team literature by exploring aspects related to this research gap. This is done by pursuing the following research question, which seems to be both important and topical in today’s organizations:

*How should organizations compose fluid teams capable of coordination?*

The remaining part of the article is structured as follows: The following section reviews prior research from two so far unrelated streams of literature, i.e. (1) literature on team coordination and (2) literature on team composition. In the third section some methodological issues are discussed and it is argued why the chosen approach: agent-based modeling is an appropriate method for pursuing the research question. The fourth section provides a description of the developed model and its’ underlying theoretical assumptions. In the fifth section the conducted experiments are described followed by a presentation of the obtained results. The penultimate section concludes by discussing the study’s contribution to theory and the managerial implications, before a section on the limitations and suggestions for future research finalizes the paper.

2. LITERATURE REVIEW

2.1 Team Coordination Defined

Prior research has established that taskwork and teamwork are distinct and both important for team effectiveness (e.g. Marks et al., 2001). According to these authors taskwork represents interaction with tasks, tools, machines, and systems i.e. what the teams are doing. In order to accomplish taskwork the team must possess knowledge and skills about all aspects of the team task. When a team of specialists divide the collective task each team member can hold a part of the necessary taskwork knowledge and skills as long as the sum of knowledge and skills held by the entire team covers all aspects of the team’s task. Teamwork on the other hand refers to team processes that enable teams to orchestrate taskwork activities for goal accomplishment, i.e. how they integrate their contributions to the team task (Marks et al., 2001). The process of integrating team members’ contribution has been referred to as team coordination by Brannick et al. (1993). They defined team coordination as team members’ contribution to the team task and orchestrating the sequence and timing of interdependent actions. Similarly (Gopal et al., 2011) defined team coordination as the activity of managing dependencies among task activities carried out by various actors to integrate the work. Other authors have defined team coordination as the activity whereby multiple agents synchronize, integrate and apply order to the working situation (Salas et al., 2000). As demonstrated there is across a range of studies a high degree of consensus on the meaning of team coordination. Team coordination is the outcome that results when team members’ interdependent actions are integrated, orchestrated, sequenced, and timed. There is also a high degree of consensus across a range of studies that team coordination is a critical enabler of team effectiveness and team performance (e.g. Kozlowski & Ilgen, 2006).
2.2 How Teams Achieve Coordination

While there is consensus on the meaning of team coordination as an outcome and the importance of team coordination for performance there are a wide variety of descriptions of how teams achieve coordination. Within the field of organization science coordination has been studied extensively. According to this literature organizations achieve coordination by two generic strategies, (1) reliance on planned standardized procedures to achieve coordination and (2) creation of opportunities for the interdependent actors to make mutual adjustments in order to align their actions. These generic strategies have been described as coordination by plan versus coordination by feedback (March & Simon, 1958; Thompson, 1967). Mintzberg (1979) has referred to these two coordination mechanisms as coordination by standardization and coordination by mutual adjustment. In addition he has also referred to coordination by direct supervision where a leader coordinates the work on lower levels. Within the team literature there are numerous studies that consider these broad types of coordination mechanisms on the team level and also some studies conducted in settings with temporary teams. Faraj & Xiao (2006) described how coordination was achieved by medical trauma teams where the work was coordinated both by means of standardization of work prescribed in medical protocols and mutual adjustments in the process of treating patients. The authors described how team members used dialogic practices such as continuous interactions, joint sensemaking, common responsibility, and cross-boundary interventions for coordinating their work. Klein et al. (2006) focused in their study from a similar setting on the important role of team leaders for coordinating the work of the team. They reported that the team leader is critical for providing strategic direction for the team, directing the team’s focus and procedures during moments of choice or uncertainty. Bechky (2006) conducted an ethnographic study of temporary teams working in film projects and focused on how coordination was achieved by means of work roles. Team members in the studied film settings were found to rely on role expectations to guide relationships and tasks. These field studies provide rich descriptions of how coordination takes place in the temporary teams in the studied settings. However, the studies do not provide conceptual law-like explanations of why some teams coordinate better than others. It can be inferred from the studies that teams’ coordination success in settings with structural coordination mechanisms takes that team members stick to their work roles, follow the standardized work practices laid down in protocols, and adhere to the team leader’s directions. However, the studies do not provide any clear answers to the question of what will cause coordination success when teams rely on mutual adjustments.

2.3 Antecedents to Team Coordination

There are some studies that have found important antecedents of team coordination. Gittell et al. (2008) found in a field study from a hospital setting that job designs that offered opportunities for individuals to work together and strengthen their relations were conducive of team coordination. A large and growing stream of work on transactive memory systems (Wegner, 1986; Wegner et al., 1985) has considered how teams that have developed a shared knowledge of how knowledge and expertise is distributed among the team members have an advantage in coordinating their work compared to teams lacking such knowledge (Reagans et al., 2005). Many studies have shown that teams where team members have a shared experience of working together are better able to coordinate their work (Huckman et al., 2009). Scholars have argued that this shared experience helps in different way, e.g. by providing teams with psychological safety (Edmondson, 1999) and provide a shared collective mind that fosters heedful interrelation among team members in stressed situations (Weick & Roberts, 1993). The antecedents of coordination considered in the reviewed studies
all seem to require that teams work together for substantial periods of time whereby team members learn to coordinate their work. As a consequence the considered antecedents cannot be expected to play a role for fluid teams’ coordination success. In our review of the literature we did not come across any studies that pointed to antecedents of team coordination that applies when teams are fluid.

2.4 Team Composition

Team composition has been defined as the question of how people are matched to teams and roles within the teams (Hollenbeck et al., 2004). There is a long line of research that has studied how team composition affects group performance, cohesion, and social interaction, and group members’ commitment, satisfaction, and other indicators of subjective well-being (van Knippenberg & Schippers, 2007). An important question in this stream of research is whether teams should rather be composed of similar - or dissimilar team members. This question has largely been guided by two research traditions: the social categorization perspective and the information/decision-making perspective. Where the former perspective emphasizes the value of working with similar others the latter emphasizes the value of bringing together team members with diverse information, knowledge, and perspectives. Social categorization processes may result in work groups that function more smoothly when they are composed of homogeneous team members rather than diverse team members and as a result team members are more satisfied with and attracted to the group when it is homogeneous and they are similar to the other team members. In contrast to the social categorization perspective, the information/decision-making perspective emphasizes the positive effects of team member diversity. The starting point for this perspective is the notion that diverse teams are likely to possess a broader range of task-relevant knowledge, skills, and abilities. The team members with different opinions and perspectives give a larger pool of resources that may be helpful in dealing with non-routine problems (van Knippenberg & Schippers, 2007). From other lines of research we know that diverse teams need to coordinate and integrate the contributions of the members (Hinsz & Vollrath, 1997), but it seems from our review of the literature that we lack research that considers how team composition impact teams’ ability to do that. We found only one study that focused on team composition in a setting with fluid teams. The study by Huckman & Staats (2011) studied fluid software development teams and considered how diversity in team members’ experience impacted different aspects of performance. However, the study did not consider coordination as a mediating process for any of the considered performance measures.

2.5 Summing Up the Reviewed Literature

As demonstrated in the condensed literature review there is a long line of research on both team coordination and team composition. A number of studies have been made on coordination in temporary and fluid teams. These studies have mainly provided rich descriptions of how coordination is achieved, while they have not aimed at explaining why some teams are better able to coordinate than others. From the stream of research on team composition we did not find any studies that considered team composition as an antecedent to team coordination. We were able to identify only one study that considered team composition related to fluid teams and this study did not suggest a causal relation between team composition and team coordination. Based on this review we suggest that there is a gap in the literature as we lack studies that consider how team composition impacts teams’ ability to coordinate their interdependent work.
As we lack prior literature that has started to explore the proposed research gap, we shall briefly argue on a logical ground why we think it is an important gap that is worthy of research attention. There is reason to believe that team composition matters for team coordination, especially coordination by means of mutual adjustment. With inspiration from the literature on behavioral game theory (Camerer, 2003; Lave & March, 1975) we can think of a simple coordination problem where two pedestrians walk on a path that will result in a collision unless they do something to avoid it. If one of them makes a change while the other one does not they have collectively coordinated their actions successfully. In contrast, if none of them change their path they will end up in a collision. If they both change their path they may end up on a new collision path. As can be seen from this simple coordination problem the outcome depends on how the two agents collectively adapt to the situation. Drawing on this simple intuition we suggest that the way the team members adapt their behavior to the situation matters for coordination. To keep matters relatively simple we assume that the agents have perfectly aligned interest and all of them are rewarded in the same way, which means that we do not consider “prisoner-dilemma situations”. Even under these assumptions the agents’ behavioral adaptation matters for team coordination in a non-trivial way because of the interdependence between the agents. The behavior of one agent can be either successful for coordination or the opposite depending on the behavior of the other agents.

3. METHODOLOGICAL ISSUES

Large scale studies of team composition and team coordination are neither possible in rigorous laboratory experiments nor in field studies. This may explain why scant research has focused on this problem despite its importance in many applied settings. We propose that agent-based modeling is a useful approach for exploring some aspects of this problem. Agent-based modeling is a form of computation simulation. It is particularly suitable to topics where understanding processes and their consequences is important. In essence, one creates a computer program in which the actors are represented by segments of program code, and then runs the program, observing what it does over the course of simulated time. Like equation based modeling, but unlike prose, agent-based models have to be complete, consistent, and unambiguous if they are to be capable of being executed on a computer. On the other hand, unlike most mathematical models, agent-based models can include agents that are heterogeneous in their features and abilities, can model situations that are far from equilibrium, and can deal directly with the consequences of interaction between agents (Gilbert, 2008). Social systems where dependencies among the agents are important have been referred to as complex systems. The field of complex systems challenges the notion that by perfectly understanding the behavior of each component part of a system we will then understand the system as a whole (Miller & Scott, 2007). Agent-based simulations are well-suited to studying complex systems by examining how interactions between multiple heterogeneous agents cause structures at a higher level of aggregation to emerge as a result of their interaction over time (Siggelkow & Rivkin, 2006). Another strong feature of the agent-based modeling approach in the social sciences is that it allows the researcher to run controlled experiments in an isolated system and observing what happens. The great advantage of experiments is that they allow one to be sure that it is the researcher’s intervention that is causing the observed effects. In real social systems experiments are often not possible or desirable and isolation of the effect of an intervention is generally impossible. The researcher can run the agent-based model experiment as many times as he wants using a range of parameter settings or allowing some factors to vary randomly. Of course the computer simulation does not claim to precisely portray the real social world. Rather, deriving the behavior of a model analytically is useful because it provides information about
how the model will behave given a range of inputs, and by experimenting with different inputs it is possible to learn how the model behaves. The model is used to simulate the real world as it might be in a variety of circumstances (Gilbert, 2008).

4. THE AGENT-BASED MODEL OF TEAM COMPOSITION AND TEAM COORDINATION

To study the impact of team composition on teams’ ability to coordinate we created a simple simulation model coded in Java-based NetLogo language. NetLogo is a multi-agent programmable modeling environment developed by The Center for Connected Learning and Computer-Based Modeling at Northwestern University in Evanston, IL (Wilensky, 1999). The design of the model was inspired from one of the authors’ field research at a medical trauma center where he studied fluid, cross-functional teams of highly specialized medical professionals. However, a precise ontological correspondence to the trauma teams was not intended. Rather the aim was to design a general model of teamwork that focused on team members’ coordination and allowing for the researchers to experiment with different team compositions. The simulation model contained only the features essential to this problem as intentional simplification is strongly endorsed in modeling approaches (e.g. Axelrod, 1997; Gilbert, 2008). It means that we focused on team members’ characteristics that play a role for coordination while we were agnostic about all other characteristics of the team members. To clarify our intentions with the agent-based simulation model the figure below shows the graphical user interface that allows the modeler to compose teams, run the simulation, and observe the results.

Figure 1: The user interface of the agent-based model
The model simulates nine agents co-located in a physical space (the black square) for working together simultaneously on an interdependent team task with nine subtasks. Each sub-task is represented by one of the squared patches located in a circle in the physical space. Each agent must do exactly one sub-task on the team task meaning that all nine agents must contribute to the solution of the team task. In each time step agents move within the physical space with the goal of taking care of one of the sub-tasks. The lines connecting the squared sub-tasks are traces of the agents’ movements in the physical space. The agents are interdependent as the success of their moves is dependent on whether another agent moves to the same patch/subtask. If more than one agent turn up on the same patch for doing the same subtask, i.e. a coordination failure each of them must decide whether to stay with the subtask or move to another subtask in the subsequent time step. The team task is solved when each of the agents are matched with exactly one subtask. This corresponds to a situation where no agents overlap on the same subtask and none of the subtasks are omitted. In other words: the team members have coordinated their work and integrated their individual contributions to the collective team task by means of mutual adaptation. The model counts how many time steps are needed before the team task is solved. It is assumed that teams are better coordinators the fewer time steps they need to solve the task. The agents are similar in all respects except for the way they respond to coordination failure, i.e. when they find themselves in conflict with another agent trying to do the same sub-task. All agents are assumed to be adaptively rational meaning that each of them take an action, the world responds to the action, and the individual adapts his behavior so as to secure desirable responses in the subsequent time step. The way the agents adapt their behavior can be manipulated by the modeler. When the agents experience coordination failure they can be manipulated to be very likely to adapt their behavior in the subsequent time step whereas others can be manipulated to be less likely to adapt their behavior. This difference in agents’ likelihood of behavioral adaptation is implemented in the model as a probability that the agents will move to a new subtask in the next time step after a coordination failure in the current time step. The probability of adaptation can take on values from $p = 0.1$ to $p = 0.9$ with increments of 0.10. It means that the modeler must compose teams of nine agents where each agent can be chosen from one of nine different types shown in table 1 below.

<table>
<thead>
<tr>
<th>Agent Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of adaptation “go”</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>Probability of non-adaptation “stay”</td>
<td>0.9</td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Table 1: The nine types of agents

The agents’ probability of adaptation is assumed to be an exogenous variable determined by the modeler by means of the sliders in the user interface. Be setting these sliders he can compose the teams he wants to experiment with from more than 387 million possible combinations of different teams\(^2\). E.g. he can make a homogeneous team by setting the sliders for all agents in the same position. As opposed to this he can compose a

\(^2\) There are 9 settings for each of the 9 agents resulting in $9^9 = 387.420.489$ different combinations.
heterogeneous team by setting the sliders to different positions for each agent. Once the sliders are set, the simulation runs the team task and repeats it times to obtain consistent and reliable results. The resulting numbers of time steps for completing these 1,000 tasks are reported on a monitor along with the arithmetic mean, i.e. number of time steps per task.

5. EXPERIMENTS AND RESULTS

The aim of the experiments was to explore the model’s behavioral space with respect to how team homogeneity, team heterogeneity, and different rates of behavioral adaptation impacted teams’ ability to coordinate. The strategy for doing that was to focus first on the nine possible compositions of teams with completely homogeneous team members. The results from these experiments were used as base-line results in a subsequent series of experiments that aimed to explore the impact of team heterogeneity by considering how intra-team distribution of behavioral adaptation rates impacted teams’ ability to coordinate.

5.1 Homogenous Teams

The first experiment considered a team composed of nine team members all with the same rate of adaptation, $p = 0.1$. The average rate of adaptation for the team, $p_{\text{team}} = 0.10$ and the intra-team variability measured as the standard deviation, $s = 0.0$. The next experiment considered a team composed of nine team members all with the same rate of adaptation, $p = 0.2$. All nine experiments and the results are listed in table 2 and illustrated in figure 2 below.

<table>
<thead>
<tr>
<th>Experiment #</th>
<th>Probability of adaptation for the team ($p_{\text{team}}$)</th>
<th>Intra-team variability Std. deviation (s)</th>
<th>Mean number of time steps on 1,000 simulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.1</td>
<td>0.0</td>
<td>11.79</td>
</tr>
<tr>
<td>2</td>
<td>0.2</td>
<td>0.0</td>
<td>7.15</td>
</tr>
<tr>
<td>3</td>
<td>0.3</td>
<td>0.0</td>
<td>5.52</td>
</tr>
<tr>
<td>4</td>
<td>0.4</td>
<td>0.0</td>
<td>5.04</td>
</tr>
<tr>
<td>5</td>
<td>0.5</td>
<td>0.0</td>
<td>4.70</td>
</tr>
<tr>
<td>6</td>
<td>0.6</td>
<td>0.0</td>
<td>4.86</td>
</tr>
<tr>
<td>7</td>
<td>0.7</td>
<td>0.0</td>
<td>5.36</td>
</tr>
<tr>
<td>8</td>
<td>0.8</td>
<td>0.0</td>
<td>7.91</td>
</tr>
</tbody>
</table>

Table 2: Experiments with homogeneous teams
The results of the experiments suggest that among the teams with homogeneous agents, those with a moderate rate of adaptation ($p = 0.5$) are more capable of coordinating, as these teams achieved coordination in fewer time steps than homogenous teams composed of agents with either low - or high levels of adaptation. It appears to be an optimum value of adaptation where $p_{\text{team}} = 0.5$. However, as can be seen from the plot in figure 2 the differences are small for experiment 3 through 7 which suggests that coordination is tolerant to some variations in the teams’ rate of adaptation as long as they stay within the mid-range territory, whereas coordination seems to suffer when teams have adaptation levels in either the high - or the low end. An interpretation of these results suggests that team coordination deteriorates when homogeneous teams are composed of team members that are overly slow adapters because the team will be stuck for a prolonged period of time when a coordination failure is realized whereas teams composed of members that adapts too fast, will solve one coordination problems but as they do so, they will end up in a new coordination failure. In conclusions team members in homogenous teams should be neither too little - nor too much adaptable when they coordinate their work by mutual adjustments.

### 5.2 Heterogeneous Teams

In order to explore the impact of team compositions with different levels of intra-team heterogeneity we composed 14 teams with the same average rate of adaptation as considered in the experiments with homogenous teams but this time with intra-team distributions of behavioral adaptation rates equal to standard deviation, $s = 1.0$; $s = 2.0$; and $s = 3.0$. The settings for the 14 experiments are listed in table 3 below.
The obtained results from the experiments with heterogeneous teams are shown in table 4 below with results obtained from the experiments with homogeneous teams included in column 2 for comparison.

Table 3  Experiments with heterogeneous teams

<table>
<thead>
<tr>
<th>Agent ID</th>
<th>18</th>
<th>27</th>
<th>36</th>
<th>45</th>
<th>54</th>
<th>63</th>
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<td>18</td>
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<td>Mean</td>
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<td>3,00</td>
<td>3,00</td>
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<td>4,00</td>
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<tr>
<td>Std. Dev.</td>
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<td>2,00</td>
<td>1,00</td>
<td>2,00</td>
<td>3,00</td>
<td>1,00</td>
</tr>
</tbody>
</table>

Table 4  Results from experiments with heterogeneous teams

<table>
<thead>
<tr>
<th>Adaptability Team average</th>
<th>Homogenous teams</th>
<th>Heterogeneous teams</th>
<th>Std. Dev. 1</th>
<th>Std. Dev. 2</th>
<th>Std. Dev. 3</th>
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</thead>
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<tr>
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<td></td>
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<td></td>
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</tr>
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<td>0,2</td>
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<tr>
<td>0,3</td>
<td>5,52</td>
<td>6,14</td>
<td>6,44</td>
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<td></td>
</tr>
<tr>
<td>0,4</td>
<td>5,04</td>
<td><strong>4,88</strong></td>
<td>5,13</td>
<td>6,03</td>
<td></td>
</tr>
<tr>
<td>0,5</td>
<td>4,70</td>
<td><strong>4,68</strong></td>
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<tr>
<td>0,8</td>
<td>7,91</td>
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</table>

The results from the experiments with heterogeneous teams suggest that there is little to be gained from composing heterogeneous teams rather than homogenous teams. Compared to the base-line results with homogenous teams only team compositions in the mid-range \(0.4 < p_{\text{team}} < 0.7\) with a moderate intra-team distribution equal to \(s = 1\) yielded slightly better results. All other experiments revealed that intra-team heterogeneity was detrimental to team coordination.

5.3 Summing Up the Results

Together the results suggest that both the teams’ average rate of behavioral adaptation and the intra-team distribution of team members’ rates of adaptation matters for teams’ ability to coordinate. Teams with average rates of adaptation in the mid-range territory are better coordinators and too fast – and too slow adapting teams should be avoided. In addition it
seems that teams that are homogeneous with respect to behavioral adaptation in most cases are better coordinators than teams that are heterogeneous in that respect. Having said that homogeneous teams seems to be preferable for coordination the results also suggest that teams can tolerate some heterogeneity before coordination is severely deteriorated as the results obtained for $s = 1.0$ and $s = 2.0$ are close to the results obtained for the homogeneous teams.

6. DISCUSSION AND CONCLUSION

We applied an agent-based modeling approach to explore how team composition impacts teams’ ability to coordinate. We designed a model that allowed us to run experiments with various team compositions and observe the impact on team coordination. We found that homogeneous teams with moderate rates of behavioral adaptation were most capable of coordination. The result that moderate levels of adaptation is preferable is not surprising as our intuition tells us that too fast adaptation and too slow adaptation both are likely to result in coordination failures. The result that homogeneous teams in general are better coordinators than heterogeneous teams is more surprising and counterintuitive. Derived from the example with two pedestrians coordinating their actions to avoid collision, we expected that team compositions with some slow adapters and some fast adapters would be perfect for coordination and yield the best results. This was not what we found in our experiments.

6.1 Theoretical Contributions

The paper makes several contributions. The study is to our best knowledge the first to focus on the relation between team composition and team coordination. By doing that the study relates two well established streams of research and we believe that this intersection is fruitful ground for future research. We have suggested that research on the relation between team composition and team coordination in particular seems promising with respect to contributing to the growing research interest in fluid teams in the team literature (Edmondson & Nembhard, 2009; Huckman & Staats, 2011) as these teams cannot rely on building coordination capabilities based on team member familiarity, as they do not acquire experience of working together in stable relations.

The study also contributes to the team composition literature by suggesting that team composition research should focus on team coordination as an outcome. There is reason to believe that future research will be able to resolve some of the conflicting evidence that plague the team composition literature (van Knippenberg & Schippers, 2007) by focusing research attention on variables that impact team coordination.

6.2 Managerial Implications

The findings of the study have important implications for the managers tasked with leading team based organizations. First, they show that managers should aim for composing teams with moderate rates of behavioral adaptation. This recommendation stands in contrast to the often advocated notion that it is preferable to have teams that are capable of fast adaptation. Second, managers should try to compose teams that are homogeneous or moderately heterogeneous, as too much intra-team heterogeneity with respect to behavioral adaptation seems unwarranted. Taken together this means that managers should encourage the individuals in their team-based organizations to be neither too willing - nor too unwilling to adapt their behavior when they work in teams. In addition, it may be possible for managers to promote practices in their team-based organizations that allow team members to discuss and
evaluate their team work experience after they have completed their team tasks. Thereby they can develop a shared understanding of what it means to have an “appropriate rate of adaptation” which in turn will improve teams’ ability to coordinate and enhance their performance.

7. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

As this study has applied an agent-based modeling approach and is explorative in nature there are several limitations that should be noted. The first concern is the chosen methodological approach where we have experimented with simulated agents rather than real teams. We would suggest additional research with alternative research designs for strengthening and corroborating the results. Field studies and laboratory experiments seems both warranted at the current stage of knowledge. While team composition arguably plays an important role for team coordination, it is certainly not the only thing that matters. Prior research has established that organizations can support their teams in coordination e.g. by standardizing the work and providing teams with protocols and guidelines that prescribe appropriate ways of solving the team task (Faraj & Xiao, 2006), appointing team leaders to take care of coordination (Klein et al., 2006), assigning people to fixed work roles (Bechky, 2006), and providing training that emphasizes coordination (Salas & Cannon-Bowers, 2001). Future research is needed to explore how team composition interacts with these other coordination mechanisms to impact team coordination and performance. The model has considered nine team members as a given team size. It is very likely that team size matters for the reported results. Future research should be undertaken to clarify through experiments how smaller and larger team sizes impact the relation between team composition and team coordination. The study has highlighted some aspects of how organizations should compose teams with respect to team members’ rate of behavioral adaptation. The answer to this question raises new questions, e.g. how can we in real organizations identify team members’ with different rates of behavioral adaptation? Are newcomers more likely to be fast adapters and are employees with extensive experience more likely to be slow adapters? Are individuals’ rates of adaptation constant across different teams? These are questions for future empirical research to consider. Related to this question, it is also a task for future research to explore to what extent it is possible to change individuals’ rate of adaptation in team work settings, e.g. by applying different sorts of team training interventions. Finally, the model in this study has assumed that individuals’ rate of behavioral change is an exogenous variable, set by the modeler. While we believe that this makes sense when we consider fluid teams that do not develop a story of working together, it is an issue for future research to find out whether individuals’ rate of adaptation should be treated as an endogenous variable in permanent teams where mutual reinforcement learning is likely to cause changes over time.
References


