Majority Decision Making Works Best under Conditions of Leadership Ambiguity and Shared Task Representations

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MCS collected the data, organized the database, performed the statistical analyses and wrote the manuscript.

Keywords

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Abstract

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The effectiveness of decision-making teams depends largely on their ability to integrate and make sense of information. Consequently, teams which more often use majority decision making may make better quality decisions, but particularly so when they also have task representations which emphasize the elaboration of information relevant to the decision, in the absence of clear leadership. In the present study I propose that (a) majority decision making will be more effective when task representations are shared, and that (b) this positive effect will be more pronounced when leadership ambiguity (i.e. team members' perceptions of the absence of a clear leader) is high. These hypotheses were put to the test using a sample comprising 81 teams competing in a complex business simulation for seven weeks. As predicted, majority decision making was more effective when task representations were shared, and this positive effect was more pronounced when there was leadership ambiguity. The findings extend and nuance earlier research on decision rules, the role of shared task representations, and leadership clarity.

Contribution to the field

Prior research on team decision making has shown that shared task representations play an important role in the effective use of information resources in groups. However, the role of decision-making procedures and rules in team decision making has received very little research attention, along with the role of leadership clarity/ambiguity in such contexts. The current paper contributes to this field of research by studying the relationship between the use of a majority decision rule and performance as moderated by task representations and leadership clarity (and the lack thereof, leadership ambiguity). As hypothesized, the results showed that majority decision making was positively related to team performance when a high level of elaboration on information was combined with leadership ambiguity. However, under conditions of low elaboration of information, and leadership ambiguity, majority decision making was negatively related to performance. This is an important contribution to the research on leadership clarity, as it shows that under some circumstances low leadership clarity (i.e. leadership ambiguity) can be beneficial for team performance. These results also show that the relationship between decision rules and performance is more complex than previous research has suggested, as majority decision making can be sometimes positively, and sometimes negatively related to performance, with the relationship moderated by other team processes.

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Abstract

The effectiveness of decision-making teams depends largely on their ability to integrate and make sense of information. Consequently, teams which more often use majority decision making may make better quality decisions, but particularly so when they also have task representations which emphasize the elaboration of information relevant to the decision, in the absence of clear leadership. In the present study I propose that (a) majority decision making will be more effective when task representations are shared, and that (b) this positive effect will be more pronounced when leadership ambiguity (i.e. team members' perceptions of the absence of a clear leader) is high. These hypotheses were put to the test using a sample comprising 81 teams competing in a complex business simulation for seven weeks. As predicted, majority decision making was more effective when task representations were shared, and this positive effect was more pronounced when there was leadership ambiguity. The findings extend and nuance earlier research on decision rules, the role of shared task representations, and leadership clarity.

1 Introduction

> *"When exploring the Northwest Territory in 1805, Captain Clark used the majority rule to decide where to set his winter camp (Ambrose, 1996; Moulton, 2003). Everyone in the expedition, including servants and native guides, had an equal vote in the majority rule decision."*
>
> - (Hastie & Kameda, 2005, p. 506).

As Hastie and Kameda noted, the "robust beauty of the majority rule" may explain its popularity in today's teams as well as in primordial societies. This rule indeed has many virtues: transparency, ease of execution, it appeals to people's innate sense of justice, and it often yields more effective solutions to problems. When no explicit rule is established, the implicit decision rule is essentially a majority rule (Hastie & Kameda, 2005). Organizations nowadays often rely on teams when making decisions that require a wide array of knowledge (Dooley & Fryxell, 1999; Kozlowski & Bell, 2003). The effectiveness of those decision-making teams is for a large part dependent on the

decision rules they apply (Hastie & Kameda, 2005; Nitzan & Paroush, 1985; Stasser, Kerr, & Davis, 1980), and on their ability to make use of and integrate information successfully (e.g., M. C. Schippers, Homan, & van Knippenberg, 2013; van Ginkel & van Knippenberg, 2008). Although theoretically teams should be better suited to make use of information and should make better decisions, numerous studies have shown that groups often fail to exchange information (Gruenfeld, Mannix, Williams, & Neale, 1996; G. W. Wittenbaum & Stasser, 1996; G. W. Wittenbaum, Hollingshead, & Botero, 2004). Even if teams do exchange information, they often do not integrate this information when making a decision (Gigone & Hastie, 1993; for a meta-analysis see Mesmer-Magnus & DeChurch, 2009; for a review see M. C. Schippers, Edmondson, & West, 2014; van Ginkel & van Knippenberg, 2012). Prior research has shown that shared task representations – i.e. the shared realization that the task needs information elaboration – play an important role in using informational resources effectively in groups (van Ginkel, Tindale, & van Knippenberg, 2009; van Ginkel & van Knippenberg, 2008). While this research has been insightful in showing the importance of those representations for information elaboration and decision making, it has not focused on an important antecedent of team decision making and performance: decision-making procedures or rules. Teams often agree on a strategy to make decisions. A commonly used decision rule is majority decision making (Baron, Kerr, & Miller, 1992), but the task requirements often determine for a large part which decision making procedure is more effective (Beersma & De Dreu, 2002; F. S. Ten Velden, Beersma, & De Dreu, 2007). For instance, pooling preferences and making compromises may be an ineffective way of making majority decisions (van Ginkel & van Knippenberg, 2008). Faced with a (unanimous) majority, other team members may think from the perspective of the majority and may exclude other considerations, due to the stress that is caused by being in the minority (Stasser & Birchmeier, 2003). A critical thought norm may offset the possible negative sides of a decision making rule (Postmes, Spears, & Cihangir, 2001). Shared task representations may thus be especially relevant when teams apply a majority rule to make decisions, such that the integrated information is used in making the final decision (F. S. Ten Velden, Beersma, & De Dreu, 2007). Depending on the team task, for instance if teams have to make decisions that influence each other (e.g., a company decision to buy more machines may also mean having to hire personnel to run the machine), may make sure that team members voice their opinion, even if they are in the minority.

Another factor that may determine the extent to which team members voice their opinion is team leadership. The combination of shared task representations and a majority rule will prove especially fruitful in teams without a clear leader, and thus leader ambiguity (cf. Carson, Tesluk, & Marrone, 2007; West et al., 2003). In such groups, clarity of leadership – that is, team members' shared perceptions of clarity and the absence of conflict over leadership of their teams (West et al., 2003) – may be a liability rather than an asset, since a clear leader may have an uneven impact on the decision to be made (e.g., I. L. Janis, 1972; I. L. Janis, 1982), and may cause "closing of the group mind" (cf. De Grada, Kruglanski, Mannetti, & Pierro, 1999; Kruglanski & Webster, 1991; Tetlock, 2000). Thus, groups without a clear leader may be at an advantage when they have shared task representations and a majority rule, as they may make use of information better when making a decision. In the current paper, I will argue that the extent to which teams make use of a majority decision rule will be positively related to team performance under conditions of high shared task representations and lack of leadership clarity, which I will name leadership ambiguity in the remainder of the paper (see Figure 1).

Insert Figure 1 about here

The current study makes a number of contributions to the literature on team decision making and on the broader team performance literature. Specifically, it puts majority decision making and leadership ambiguity center-stage in the study of team decision making, and does so in the controlled context of a management simulation. Furthermore, it points to the importance of shared task representations, with an emphasis on sharing, discussing and integrating information. The current study points to the fact that it is the combination of those three factors that determine group outcomes, rather than isolated effects of any one of those variables. Finally, the current study emphasizes the role of leadership ambiguity, a variable that has received very little research attention so far.

2 Theoretical background and hypotheses

2.1 Shared task representations and team performance

It has now been recognized in much of the literature that groups may reach higher quality decisions when they are able to integrate information and perspectives held by different team members. Various studies have identified factors such as team leadership (Larson, Christensen, Franz, & Abbott, 1998; van Ginkel & van Knippenberg, 2012), familiarity (Okhuysen, 2001), and motivation to share information (G. W. Wittenbaum et al., 2004) as determinants for information sharing. Shared task representations entail a common understanding among the teams as to how information should be used (van Ginkel et al., 2009; van Ginkel & van Knippenberg, 2008). According to Kerr and Tindale (2004), shared task representations can be conceptualized as a shared component of mental models among team members. Thus, these can be seen as a kind of team mental model concerning how to deal with information (Cannon-Bowers, Salas, & Converse, 1993; Marks, Zaccaro, & Mathieu, 2000; Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005). Specifically, teams can improve decision making by discussing and exchanging information in the group, and this is also related to "social sharedness" (Scott & Kameda, 2000). For (distributed) information to be used effectively it needs to be carefully discussed, integrated and elaborated (De Dreu, Nijstad, & van Knippenberg, 2008; Homan et al., 2008; Schippers, Den Hartog, & Koopman, 2007; for a review see M. C. Schippers et al., 2014). However, it is important to note that, although correlated, the realization that it is important to share information (i.e. task representations) is not the same as actual sharing of information (van Ginkel & van Knippenberg, 2008). Research by Kilduff, Angelmar, and Mehra (2000) among 35 teams of managers participating in a management simulation showed that high-performing teams started out with cognitive diversity in terms of how they attributed organizational success and failure, but developed more cognitive consensus over time. However, teams often do not recognize the need for information elaboration (cf. Nijstad & De Dreu, 2012; M. C. Schippers et al., 2013), and the development of shared task representations that emphasize information elaboration may therefore be key to team success. This may be especially so when the team tends to favor majority decision making, because then the team members will be more motivated to "defend" their ideas and findings and will take more trouble to elaborate information. This may be especially so in the context of a management simulation, where decisions need to be discussed, because a decision made in one domain, influences the effectiveness of other decisions, and there is a clear need to align decisions.

Hypothesis 1: Shared task representations will be positively related to team performance

2.2 Majority decision making and team performance: The moderating role of shared task representations

Decision-making procedures or rules may affect the way teams make decisions and this may help or hinder team performance (Bianco, Lynch, Miller, & Sened, 2006). A group decision rule specifies how decisions are made within a team, and can be defined as "a rule that specifies, for any given set of individual preferences regarding some set of alternatives, what the group preference or decision is regarding the alternatives" (Miller, 1989, p. 327). The two rules used most often in groups are the majority rule and the unanimity rule (Baron et al., 1992; Hare, 1976; Miller, 1989b), although it is also conceivable that a directive team leader or dominant group member makes most of the decisions (cf. Leana, 1985; Van de Ven & Delbeco, 1971). Because unanimity requires agreement from all team members, group decisions may be harder to reach and require more discussion (e.g., Castore & Murnighan, 1978; Miller, 1989a). Teams which make many decisions in a practical or simulation context may therefore find a majority decision rule to be more efficient and less time-consuming (Hare, 1976; Kerr et al., 1976), and this rule seems to be indeed most prevalent for intact teams, as it induces team members to behave in the interest of the group (e.g., Tatsuya Kameda, Takezawa, Tindale, & Smith, 2002; T. Kameda & Tindale, 2006). Furthermore, the use of a majority rule based on shared preferences provides a "fast and frugal" heuristic in complex decision environments (Hastie & Kameda, 2005). However, although a majority rule may ensure quicker decision making, group members may fail to discuss the underlying assumptions (Mohammed & Ringseis, 2001), and teams using a decision rule of this kind may need to take precautions in order to ensure informed decision making (cf. Kerr & Tindale, 2004; Nijstad & De Dreu, 2012; Winquist & Larson Jr, 1998). Also, a study reanalyzing data from prior studies concluded that majority-rule procedures can be susceptible to agenda setting and other forms of strategic behavior and that "the potential for mischief depends on the distribution of preferences that decision makers bring to the process, and the range of feasible outcomes—the uncovered set—generated by these preferences" (Bianco et al., 2006; p. 850).

It is therefore pertinent to ask under what conditions a majority rule will be best for team decision making, and it can be argued that this is situation-specific (Beersma & De Dreu, 2002; Kerr & Tindale, 2004; Mohammed & Ringseis, 2001; F. S. Ten Velden et al., 2007; F. S. Ten Velden et al., 2007). However, research on decision making rules has so far mainly focused on situations where there is one correct answer or choice (e.g., Kerr et al., 1976; for a review see Kerr & Tindale, 2004), or where there are misaligned interests, with different subgroups having differing interests which could be resolved by negotiation (e.g., Mohammed & Ringseis, 2001; F. S. Ten Velden et al., 2007). For instance, experimental research among 97 three-person groups in a negotiation situation showed that under a majority rule, proself oriented majority members coalesce at the expense of the minority. However, in situations where interests are aligned, and where teams are striving for the same collective outcome, a majority rule could ensure efficient decision-making (F. S. Ten Velden et al., 2007). In such cases, teams are more inclined to elaborate on the available information and actively search for an integrative solution that benefits all team members. Importantly, however, teams in a field setting or competing in a complex business simulation will have many decisions to make, for instance inventory decisions, financial decisions, and the decision to buy a new machine to increase production reliability (e.g., De Leeuw, Schippers, & Hoogervorst, 2015; Hung & Ryu, 2008; Mathieu & Rapp, 2009). Teams may opt for different decision rules for different decisions; for instance, when teams fail to reach a consensus decision, they may switch to a majority decision rule, but will often do so after extensive discussion of the issue at hand (cf. Mohammed & Ringseis, 2001). The extent to which teams opt for a majority rule may thus be positively related to team performance if the team also has shared task representations which emphasize information

elaboration. However, teams may opt unconsciously for a decision rule and team members may hold different opinions as to which decision rule was used to make the group decisions. I expect that the combination of shared task representations and majority decision making will affect team performance.[1]

> *Hypothesis 2:* Shared task representations moderates the relationship between the extent of majority decision making and team performance, such that when:
> (a) shared task representations are *high* the relationship between majority decision making and team performance is *positive*
> (b) shared task representations are *low* the relationship between majority decision making and team performance is *negative*

2.3 Majority decision making and team performance: The moderating role of shared task representations and leadership ambiguity

In general, leadership is a crucial ingredient of team effectiveness (Carson et al., 2007; Cohen & Bailey, 1997; Hackman, 1990), and some have argued that it is *the* most critical ingredient (Sinclair, 1992; Zaccaro, Rittman, & Marks, 2001), next to the ability to integrate individual actions and operate adaptively when coordinating actions (Zaccaro et al., 2001). At the same time, research has shown that there can be negative effects when a clear leader dominates the discussion, stating his/her opinion early on in the decision-making process and eliminating dissenting opinions (Anderson & Balzer, 1991; I. L. Janis, 1972; I. L. Janis, 1982; Taggar & Seijts, 2003). Leadership clarity, or lack thereof, leadership ambiguity, was introduced by West et al. (2003), referring to the "shared perceptions of group members about the extent to which leadership roles are clear within the team" (p. 395). Although most of the leadership research so far has focused mainly on the contribution made by a single (team) leader, in recent years more attention has been paid to other forms of leadership such as emergent leadership (e.g., Cogliser, Gardner, Gavin, & Broberg, 2012; Taggar, Hackett, & Saha, 1999; Yammarino, 2012), and shared/distributed leadership (Carson et al., 2007; for a review see D'Innocenzo, Mathieu, & Kukenberger, 2014; C. L. Pearce & Conger, 2003; C. L. Pearce & Manz, 2005; Sun, Jie, Wang, Xue, & Liu, 2016). Leadership has been shown to be important even in teams where there is no formal appointed leader, such as in self-managed teams (e.g., Nygren & Levine, 1996), and it seems that in general teams are less likely to be successful when they have no clear leader (Cohen & Bailey, 1997).

Although research indeed showed that clarity of leadership is important for team innovation and effectiveness (for a review see Smith, Fowler-Davis, Nancarrow, Ariss, & Enderby, 2018; West et al., 2003), recent research in the area of shared leadership, defined as "an emergent and dynamic team phenomenon whereby leadership roles and influence are distributed among team members" (D'Innocenzo et al., 2014; p. 5) shows that this form of leadership was more common in teams with a shared purpose, social support and voice, and this in turn was positively related to team performance (Carson et al., 2007). Recent research among 43 intact work teams undertaking complex, knowledge-based tasks showed that shared leadership was positively related to innovation (Hoch, 2013). Thus, shared leadership seems to be especially useful for teams facing complex decision-making tasks where the expertise of all team members is needed to make a high-quality decision (Craig L. Pearce & Manz, 2005), and it thus seems that the *absence* of (clear) team leadership can in fact be beneficial for teams. Langfred (2000; 2007) comments on the paradox of self-management. He argues and finds that the flexibility and adaptability of self-managed teams can become dysfunctional under certain circumstances, such as in response to conflict.

However, shared leadership and/or self-management in teams is not the same as leadership ambiguity. In the context of shared leadership different people have a leadership role, while leadership ambiguity is about absence of clarity regarding who is taking the lead. Although we do not know of any research that has investigated the relationship between leadership ambiguity and team performance for teams making complex decisions, we propose that under some circumstances, leadership ambiguity can be beneficial for team effectiveness. Since a clear leader often tends to dominate the discussion, thereby disproportionally influencing the decision (cf. Anderson & Balzer, 1991; I. L. Janis, 1972; I.L. Janis, 1982; Taggar & Seijts, 2003), the absence of a clear leader may ensure a more thorough discussion of the problem at hand, especially when there are task representations that emphasize information elaboration (cf. Anderson & Balzer, 1991; De Grada et al., 1999; Kruglanski & Webster, 1991; Pierro, Mannetti, De Grada, Livi, & Kruglanski, 2003). This will ensure higher team performance, with the group opting for a majority decision-making rule relatively often. Thus, a majority rule can ensure commitment to the decision, but this will only aid team performance if the decision quality is enhanced by having shared task representations, i.e. the shared realization that the task needs information elaboration, and a high level of leadership ambiguity (cf. West et al., 2003). The idea here is that under some circumstances, leadership ambiguity can be an asset, as this is compensated for by shared task representations and majority decision making.

In short, for teams facing a complex task, and high on leadership ambiguity, majority decision making will positively influence team performance when the team also has shared task representations that emphasize information elaboration.

Hypothesis 3: Shared task representations and leadership clarity/ambiguity will jointly moderate the relationship between the extent of majority decision making and team performance, such that:

(a) When shared task representations are *high*, combined with leadership ambiguity, the relationship between majority decision making and team performance will be *positive.*
(b) When shared task representations are *low*, combined with leadership ambiguity, the relationship between majority decision making and team performance will be *negative*
(c) For other combinations of shared task representations and leadership ambiguity, there will be no difference in team performance under conditions of high or low majority decision making.

3 Methods

3.1 Sample and procedure

Data for this study were collected by means of a survey handed out to all team members as part of a larger investigation involving teams taking part in a supply chain business simulation. As such, my study is on the relationship between different subjective perceptions of team processes, with the objective performance as team outcome measure. The initial sample consisted of a total of 376 people, distributed over 94 four-person teams. Participants were professionals, for instance general managers, operational managers, financial managers, and supply chain managers, as well as small number of supply chain management students that played the game as a learning experience. Most participants had direct or indirect experience in supply chain management, and were playing the game on a voluntary basis, or as part of a supply chain management course. The response rate for the online survey was 83% (258 persons from 82 teams). One team was removed from the analysis, due to their low participation during the game, as a result of which the team did not receive scores on the dependent variables. For teams to be included in the final dataset, at least two of the four team

members had to have completed the survey. This resulted in a final sample that consisted of 254 persons from 81 teams. Of these respondents, 76.4% were male and the average age was 33.7 years (SD = 9.42). 81.5% of the respondents were Dutch nationals, the remaining respondents were American (18.5%); 39.8% of the respondents had at least a bachelor's degree and 2.7% had another advanced degree or professional qualification.

3.2 The simulation

In the operations management domain games and simulations represent an important learning tool regarding the intricacies of team and cross-functional decision making (Sweeney, Campbell, & Mundy, 2010). The "Fresh Connection" business simulation requires members to work as an integrated sales and operations team (https://www.thefreshconnection.biz/). The game is played in a competition with other teams, although the performance was not dependent on those other teams. The game has some similarities to the "Beer Game" (Goodwin & Franklin, 1994; see also Gino & Pisano, 2008), although in this particular game the participants were expected to run the whole company, with an emphasis on the supply chain (De Leeuw et al., 2015). As such, it is more rich and complete than most other games, such as the beer game which is aimed at the distribution side of the supply chain. The interactive, computer-based simulation was an ongoing experiential exercise for professionals working in the field, and was based on events in the production and supply of fresh juices to customers. In this management simulation, a decision-making team has to consider issues such as its sales and operations plan for the purchasing of supplies, demand forecasting, product management, pricing, promotions, delivery lead times, capacity planning (including decisions among others involving the number of shifts, capacity planning (including decisions involving the number of shifts, overtime, scheduled maintenance), production planning, and inventory planning. There were four different roles within each team: a supply chain vice-president (responsible for supply chain strategy and control decisions), a purchasing vice-president (responsible for the choice of suppliers, supplier agreements etc.), an operations vice-president (concentrating on the organization of operations and the warehouse), and a sales vice-president (responsible for decisions on customer service, the priorities of orders, and promotional activities). The Sales & Operations Planning process is key to company success and encompasses more than only the supply chain department (De Leeuw et al., 2015). The Fresh Connection products, such as fruit juices, are stored in pallets in the finished goods warehouse. The products have a shelf life of 20 weeks, and stay in the warehouse, until a delivery is made, or the shelf life expires. Local and regional suppliers deliver the raw materials, and concentrated fruit juice is acquired from fruit traders. During the game, team members received information relevant to their role. It was important to share this unique information with all team members. Although most teams passed on the information received in the emails to other team members, the extent to which the information was actually processed and elaborated upon varied across teams.

Participants were expected to run the company for seven decision periods of one week each, that is, seven rounds, where each week actually represented six trading months for the company in the game. Teams that participated in the research received feedback on their team level scores and on the meaning of their measures. The simulation was highly realistic, and was related to actual work settings, and had high dynamic and coordinative complexity (see also Seijts, Latham, Tasa, & Latham, 2004). Care was taken to ensure the realism of the simulation, including role descriptions, background information, graphics, pictures, e-mail simulation, organizational charts, and interactive activities. During the game, besides e-mail messages to individual team members, the teams as a whole were sent e-mail messages about various events and developments such as new clients, delivery problems, special customized products, etc. Teams were expected to integrate and make

sense of all this information in order to reach decisions and make choices (for a screenshot of the game, See Figure 2). Many decisions are made when playing the game, and trade-offs were implied in every decision. The extent to which teams were able to balance these trade-offs, determined their performance (ROI)

The game started with a video message from the former CEO, who explained current issues in the company. Team decisions were uploaded and processed and the simulation then provided a weighted team-performance composite for each round. Furthermore, the teams received detailed feedback reports (for an elaborate descripion of the game see De Leeuw et al., 2015).

3.3 Measures

After the participants had completed the game, but before they received feedback on their final performance, they filled in a survey that measured various team processes (see Appendix for all items used in the survey).

Shared task representations. Five items were used to measure the degree to which team members shared and discussed the distributed information and subsequently integrated the implications of this information within their decision making (van Ginkel & van Knippenberg, 2008). The items were slightly adapted to fit the context of the game. An example item is "For high quality performance it was important to base the decision on as much information as possible" (1=strongly agree, 5=strongly disagree, $\alpha = 0.61$, $F = 1.61$, $p < .01$; $ICC(1) = .16$, $ICC(2) = .61$, $rwg_{(j)} = .92$.

Majority decision making. A measure of majority decision making was developed within the context of the current study, based on prior literature (e.g., Bianco et al., 2006; F. S. Ten Velden et al., 2007). Similar to the measure of leadership ambiguity, each respondent was asked to indicate "How were decisions made in your team?" Respondents could select one of the following options: "We had a majority rule", "All decisions were made as a team", "One dominant team member made most of the decisions". [2] Majority decision making was calculated to represent the proportion of team members indicating that a majority rule was used to make the team decisions.

Leadership ambiguity. A measure developed by West et al. (2003) was used to assess leadership ambiguity (in the research of West and colleagues this construct was named leadership clarity). Respondents were asked to indicate: "To what extent is there an overall leader/coordinator in your team?" They were requested to select one of the following options: "There is a very clear leader/coordinator", "A number of people lead/coordinate the team", "There is no clear leader/coordinator", "There is conflict over who leads/coordinates the team" and "We all have leadership roles". Following West et al. (2003), leadership clarity was measured by the proportion of respondents who either said: "There is no clear leader/coordinator" or "There is conflict over who leads/coordinates the team". Since none of the teams indicated that there was conflict over who was leading the team, leadership ambiguity was calculated to represent the proportion of team members indicating that there was no clear leader or coordinator.

Team Performance. Team performance in the simulated game was assessed by the team score of Return on Investment (ROI) of the fictitious company. The objective for each team is to achieve the best return on investment (ROI). It was not only crucial to make as much money as possible, but also to manage investments in a proper way (see also De Leeuw et al., 2015). As each round represented a decision horizon of six months, the focus of the game is on strategic and tactical supply chain decisions (for a screenshot of the game, see Figure 2). After each round participants could see their performance and compare with other teams in the competition. Each round players make progressively more difficult decisions, as complexity is gradually added each round. It is key for teams to choose a strategy and to make decisions in accordance to the chosen strategy.

Furthermore, performance in each round is calculated independently, and teams do not suffer negative consequences resulting from poor decisions, or profit from very good decisions made in earlier rounds (De Leeuw et al., 2015).

The simulation automatically calculated a team's overall score by indexing each factor on a scale of -1 to 1, according to the team's relative performance in the simulation. The final score represented a weighted average of the score over six rounds, where the last two rounds were the most important in determining the final score for the team, and the lowest score was discarded. The scores on ROI can be seen as a percentage score (similar to other simulations, (e.g., Mathieu & Rapp, 2009), and varied from -0.46 to 0.17, $M = 0.03$, $SD = 0.11$. In addition to the team score there also is an individual score for each role in the team. These individual scores do not count toward the team score, but did allow participants to compare their performance relative to peers in other (competing) teams.

Control variables. Control variables were age, gender, supply chain management knowledge ("How much knowledge do you have about supply chain management"; 1= very little, 5 = a lot), prior experience with management simulations ("How experienced are you in playing management games"; 1 = not at all, 5 = very experienced), and number of hours per week spent on the game.

4 Results

4.1 Data aggregation

Our theory and measurement were aimed at the team level of analysis, with the dependent variable of interest being a team-level variable, ROI. Although in the current study individuals were nested within groups, multilevel techniques were not applied, as for these analysis the dependent variable needs to be at the lowest level of analysis (in this case the individual level; (Bryk & Raudenbush, 1992). Although individual level scores were provided in the game, these scores did not determine the outcomes, as cross-functional integration and a clear strategy were key for performance in the game. Because the present study focused on a group-level dependent variable (i.e., team performance), aggregation to the group level is the most appropriate strategy to analyze the data (Kashy & Kenny, 2000). As presented above, the ICC(1) value and the $rwg_{(j)}$ value were sufficient to justify aggregation (P.D. Bliese, 2000; James, Demaree, & Wolf, 1984, 1993). Since the ICC(2) value also depends on team size, with higher values of ICC(2) as team size increases (P.D. Bliese, 2000), I chose to depend mainly on the outcomes of ICC(1) in deciding whether or not to aggregate the individual-level scores. I therefore used the mean (i.e. the average; see also Barrick, Stewart, Neubert, & Mount, 1998) of the team members' scores to represent shared task representations at the team level. This was not the case for majority decision making, and team leadership ambiguity, as these had discrete answer categories, and not a relative score.

4.1.1 Descriptive statistics

As can be seen in Table 1, age is positively related to experience ($r = .20$, $p < .05$), knowledge of supply chain management (SCM) ($r = .27$, $p < .05$), shared task representations ($r = .31$, $p < .01$), and team performance ($r = .20$, $p < .05$). Gender is negatively related to SCM knowledge ($r = -.31$, $p < .01$). Also, the hours spent on playing the game are positively related to shared task representations ($r = .18$, $p < .05$), but not significantly positively related to team performance ($r = .13$, *ns*). Teams with a lot of SCM knowledge seemed to opt for majority decision making slightly less ($r = -.21$, $p < .05$), possibly because it was easier for them to reach a consensus decision. Finally, shared task representations are positively related to team performance ($r = .23$, $p < .05$), while the extent to which

teams opt for majority decision making is negatively related to team performance (r =-.22, p < .05). This may indicate that teams choosing a majority rule have more problems in making decisions and opt for this rule in order to make a decision[3].

Insert Table 1 about here

4.1.2 Hypothesis Tests

Prior to the analyses, all continuous independent variables were mean-centered (Aiken & West, 1991). The hypotheses suggest one two-way interaction, and one three-way interaction, and we tested whether each interaction added unique variance by testing them in one model. Table 2 reports the series of regression models to test both the main effect of shared task representations on team performance and the hypothesized moderator effects. In each regression analysis, the control variables are entered as the first step.

In line with Hypothesis 1, hierarchical regressions showed that there is a significant, positive relationship between shared task representations and team performance (β = .23; p < .05; see model 3), however this relationship is only significant in combination with the two-way interaction. When the three-way interaction is added in model 4, this relationship is no longer significant. Hypothesis 2 predicted an interaction between majority decision making and shared task representations that emphasize information elaboration. Hierarchical regressions indeed showed that this predicted interaction was indeed significant (β = .25; p < .05; see Figure 1). To determine the nature of this interaction, we performed simple slopes analysis (Aiken & West, 1991). These tests showed that for teams with relatively high shared task representations (one SD above the mean), a positive relationship between majority decision making and team performance was found; t = 2.71, p < 001. For teams with relatively low shared task representations (one SD below the mean), this relationship was negative; t = -5.01, p < .001. This indicated that under conditions of high majority decision making, shared task representations that emphasize information elaboration are related to higher team performance.

Insert Table 2 and Figure 3 about here

Hypothesis 3 implied a three-way interaction between majority decision making, shared task representations that emphasize information elaboration and leadership ambiguity. Hierarchical regressions showed that this predicted interaction was indeed highly significant, (β = .32, p < .01; see Table 2, and Figure 2). Visual inspection of the figure indicates that team performance is highest when majority decision making is high, and when high task representations are combined with *high* leadership ambiguity. A combination of low task representations and high leadership ambiguity is related to low team performance. Simple slope analyses showed that when task representations were low (one SD above the mean) and leadership ambiguity was low, the slope of low task representations/high leadership ambiguity was significant (t = -4.75, p < 001). The slope of high task representations and high leadership ambiguity was only marginally significant (t = 1.83, p = .07). As expected, the slope difference test was insignificant for low task representations/low leadership ambiguity (t = .23, *ns*) and for high task representations/ low leadership ambiguity (t = .01, *ns*). In addition, slope difference tests were calculated for all six pairs of the slopes (J. F. Dawson & Richter, 2006). These allow for comparative tests between sets of slopes, as opposed to the absolute tests of single slopes calculated by the simple slope analyses presented above (J. F. Dawson, 2014). These

tests indicated that that there are significant differences for three pairs of slopes. The difference between slope 1 (high shared task representation/high leadership ambiguity) and slope 3 (low shared task representation/high leadership ambiguity) was significant ($t = 3.88$, $p < .001$). The difference between slope 2 (high shared task representation/low leadership ambiguity) and slope 3 (low shared task representation/high leadership ambiguity) was also significant ($t = 2.35$; $p < .05$), and finally the difference between slope 3 (low shared task representation/high leadership ambiguity) and 4 (low shared task representation/low leadership ambiguity) was also significant ($t = -2.73$; $p < .01$). Overall, it seems that the combination of low shared task representation with high leadership ambiguity differed significantly from all other slopes. These findings indicate that especially under conditions of high majority decision making, a combination of shared task representations that emphasize information elaboration and high leadership ambiguity is positively related to performance.

Insert Table 2 and Figure 4 about here

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5 Discussion

5.1 Pattern of results

Decision-making groups with a complex task and distributed information often do not make optimal use of their informational resources (Stasser & Birchmeier, 2003). The decision rule used by the team may be of the utmost importance, but cannot be seen in isolation from other aspects of group process and leadership, i.e. task representations that emphasize elaboration of decision-relevant information, and leadership ambiguity. The current study showed that (perceptions of) majority decision making was related to superior team performance when teams were also high on shared task representations that emphasize elaboration of information. A three-way interaction showed that a high level of majority decision making was positively related to superior team performance when a high level of elaboration on information was combined with leadership ambiguity. High majority decision making was related to a lower level of performance under conditions of low elaboration of information, combined with leadership ambiguity. Although the simple slope analysis indicated that especially the combination of a low level of shared task representations/ leadership ambiguity is most explanatory under conditions of low versus high majority decision making, the slope difference tests showed that the this particular slope was significantly different from the combination of *high* level of shared task representations/ leadership ambiguity. Moreover, these two slopes differed significantly from the other two slopes (high shared task representations/low leadership ambiguity and low shared task representations/ high leadership ambiguity). Concluding the combination of high shared task representation/high leadership ambiguity seemed to enhance performance if the teams opted relatively often for a majority rule, whereas performance seemed to suffer most when there were low shared task representations, leadership ambiguity and use of a majority rule.

The substantive contributions of the current study are twofold. First, I extend existing theory on decision rules by showing that these are more effective in combination with task representations. Second, I build on the emerging literature of emerging and shared leadership by showing that under some circumstances leadership ambiguity can be beneficial for team performance. While it has been reasoned that a clear leader is imperative in providing a compelling direction and in ensuring clarity of and commitment to team objectives (West et al., 2003), the current study shows that when teams have a compelling sense of direction in terms of shared task representations, leadership clarity can actually be detrimental for team performance when majority decision making is high.

5.2 Theoretical and practical implications

Prior research showed that clarity of leadership was more important for larger teams in terms of innovation, probably because, in such teams, having a clear team leader prevented loss of coordination (West et al., 2003). Although a transformational team leader can play a role in developing a shared vision and in turn promoting team reflexivity (M.C. Schippers, Den Hartog, Koopman, & van Knippenberg, 2008), the current study shows that under conditions of high majority decision making, leadership ambiguity can be positive when shared task representations are also high. This means that the current shows that leadership ambiguity can be beneficial under the right circumstances. Managers should therefore consider under which circumstances the "leader decides" rule should apply, and under what conditions the majority rule is more beneficial (cf. (cf. Hastie & Kameda, 2005). If a decision is made opting for a majority rule, then a manager or leader should be less prominent or even absent. Also, such a decision should be made in teams that have task representations emphasizing elaboration information.

Theoretically, it should be noted that authority differentiation, or the extent to which all team members are involved in team decision making processes (Hollenbeck, Beersma, & Schouten, 2012), has some similarities to majority decision making. However, in the context of the current paper, I was especially interested in the rules that teams use to make decisions. Thus, while authority differentiation can be related to the process of decision making, and the extent of involvement of team members in this process, a decision rule may still be implied to make the actual decision. Future research could focus on the role of authority differentiation that precedes decision making.

5.3 Limitations and future directions

While an obvious strength of the current study is that I tested the hypotheses with a large number of teams, comprising mainly of professionals in a realistic setting, we should recognize that only experimental studies can speak to the causality implied in the research model. A clear direction for future research would thus be to follow this work up in experimental designs, manipulating decision rules, shared task representations and leadership ambiguity. Also, not all teams were experienced in the field of supply chain management, although I did control for this in the analysis.

A limitation of sorts is that while I do indeed have evidence of the core team processes and decision rules involved – shared task representations, majority decision making, and leadership ambiguity – how that played out in practice is not completely clear. That is, I do not know exactly what happened in teams with leadership ambiguity, and whether in teams with leadership ambiguity there was indeed more room for elaboration of task-relevant information. Furthermore, elaboration of information might also have taken place more implicitly, as team members could also elaborate information as a habitual practice without conscientious, or explicit awareness. Also, the question is whether teams performing well in the game, also perform well in the real world. While evidence in this respect is not required for the test of our hypotheses – nor is any specific content suggested by our analysis – such information could be extremely helpful in further developing our analysis, as it may provide key pointers as to as to what factors influence the effectiveness of majority decision making. Future research to address this issue would therefore be very valuable.

Also, it should be noted that none of the teams reported conflict over leadership. While an earlier study found leadership ambiguity to be a combination of "there is no clear leader/coordinator" and "there is conflict over who leads/coordinates the team", (West et al., 2003) in the current study this variable denoted solely the absence a clear leader/coordinator, since none of the team members indicated conflict over leadership. Hence, our results may slightly differ from those earlier results, for instance the finding that leadership ambiguity was negatively related to team processes and team

innovation (West et al., 2003). In the current study, leadership ambiguity as such was unrelated to team performance. The absence of conflict over leadership may have ensured there was no direct negative relationship. Also, the dependent variable in the study of West et al. (2003) was innovation, and it could be that leadership ambiguity is more negatively related to innovation than to team performance. Future research could incorporate both innovation and performance as dependent variables.

Another limitation has to do with the reporting of moderated multiple regression (MMR). Recent theorizing discussed the fact that these analyses often report small effect sizes, as well as often being underpowered (Murphy & Russell, 2017). A 20-year review noted that outcome reporting bias may play a role, especially if sample sizes are small, and/or the p value is just below the .05 threshold (O'Boyle, Banks, Carter, Walter, & Yuan, 2019). In the current paper, neither of these were the case, lending more value to the found results. Nevertheless, we cannot be certain that this is not a type II error. Furthermore, although I did hypothesize the relationships with respect to the two- and three ways interaction before-hand, I also used a combination of a priori reasoning and abduction (" a form of reasoning that moves from observations in a specific situation, information source, or data set to an explanation that accounts for those particular observations" (Behfar & Okhuysen, 2018; p. 325). Future research could test whether the two- and three-way interaction that was visible here will be found in similar other datasets as well. Also, there are some limitations with respect to common method variance, since all variables are self-report and assessed at the same time, need to be acknowledged (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). On the other hand, it must be noted that we did assess the outcome measure at a later point in time.

Finally, we did not formally model any time-sensitive mediating or moderating models that might have accounted for the observed relationships (cf. Mathieu & Rapp, 2009). Future research could measure the core variables (majority decision making, task representations and leadership ambiguity) each week and use growth modeling to see whether the model holds up over time, and what the dynamics are over time (e.g., P. D. Bliese, Chan, & Ployhart, 2007; Ployhart & Vandenberg, 2010).

5.4 Conclusion

The current study integrates and extends theorizing on the relationship between decision rules and team processes. Since the use of decision rules can greatly influence the team process and outcomes (e.g., Hastie & Kameda, 2005), it is imperative to know the contingencies of the relationship between decision rules and team performance. My analysis has shown that the relationship with performance is not a simple one. Under conditions of high majority decision making, the relationship with team performance is moderated by both task representations and leadership ambiguity. The implication for those interested in optimizing team performance is that, for complex decision-making tasks, to make optimal use of the majority decision rule, task representations emphasizing information elaboration should be high, while leadership ambiguity should be high.

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7 Footnotes

[1] One of the reviewers noted that it would be hard to predict an exact shape of interactions, and that it would be good to elaborate on this issue in the introduction. Note that although I did predict a two and three-way interaction, the exact shape was hard to predict from existing theory. I did have a general idea of what the shape would be before I gathered the data. However, in rewriting this paper, I also rewrote the hypotheses (thanks to the reviewer for the helpful suggestion), and thus used a combination of a priori reasoning and abduction (Behfar & Okhuysen, 2018). The overall shape of the interactions was as predicted.

[2] Two other options, added by the game provider, were "We argued a lot about the decisions we had to make" and "We often agreed quickly". Hardly any teams opted for these, and adding these options as control variables did not change our pattern of results. When we added a unanimity rule of collective decision making ("All decisions were made as a team") as a control variable to the regression analysis, our pattern of findings also remained unchanged.

3 Note that the extent to which teams indicated that "there is a very clear leader" was as expected negatively related to leadership ambiguity (r = -.616, p<.001). Although we could have opted for collapsing these items, for this paper we chose to stick to the item as used in prior literature.
For the items on decision making rules, only the items on unanimity rule (All decisions were made as a team) and majority rule (We had a majority rule) were relatively highly correlated (r=-.513 p<.001). The relationship between majority decision making and one dominant team member making all decisions was rather low, and not significant (r=-.124; ns). Since I was interested in the effect of majority rule (and not the unanimity rule), I decided not to collapse these items. None of the items was significantly related to team performance. When added as control variables to the regression analysis, the pattern of results did not change.

8 Appendix: Measures used

Task Representations

1. For high quality performance it was important to base the decision on as much information as possible
2. Strategy discussions among team members were crucial for high performance.
3. Discussing all members' information was of crucial importance for attaining high decision quality on this task
4. I had the impression the other team members would appreciate discussion
5. I expected my team members to be open for critics and allow for critical discussions to take place

Decision making process

How where decisions made in your team?

☐ One dominant team member made most of the decisions
☐All decisions were made as a team
☐ We had a majority rule

Leadership ambiguity

Was there a clear overall leader in your team?

☐ There was a single very clear leader/co-ordinator
☐ A number of people lead/co-ordinate the team
☐ There was no clear leader/co-ordinator
☐ There was conflict over who leads/co-ordinates the team
☐ We all had leadership/co-ordinator roles

Control variables items

- How much knowledge do you have about supply chain management?
- How experienced are you in playing management games?
- How much time did you spend playing the game? ……. Hours per week

886 Table 1.

887 *Means, Standard Deviations and Aggregate Level Intercorrelations*

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Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Age	33.61	8.59	-								
2. Gender	1.50	.50	-.10	-							
3. Hours spent	4.24	2.21	-.01	.12	-						
4. Management simulation experience	2.17	.79	.20*	-.14	-.15	-					
5. SCM knowledge	3.56	.77	.27*	-.31**	-.07	.51***	-				
6. Shared task representations	3.84	.41	.31**	-.00	.18*	.01	.14	-			
7. Majority decision making	.10	.20	-.07	-.03	.04	-.06	-.21*	-.12	-		
8. Leadership ambiguity	.35	.31	.00	-.00	-.16	-.03	.03	.03	.06		
9. Team performance (ROI)	.08	.13	.20*	.06	.13	.09	-.13	.23*	-.22*	-.10	-

889 *Note.* N = 81 teams; *p <.05, ** p <.01, *** p <.001; two-tailed. SCM = Supply Chain Management; ROI = return on investment
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Table 2.

Hierarchical Regressions with Dependent Variable Team Performance (ROI)

	Model 1		**Model 2**		**Model 3**		**Model 4**	
Variable	β	SE	β	SE	β	SE	β	SE
Control Variables								
Age	.16	.00	.12	.00	.03	.00	.05	.00
Gender	.12	.03	.10	.03	.01	.03	-.02	-.01
Hours spent	.13	.01	.10	.01	.07	.01	.12	.01
Management simulation exp.	-.01	.02	.01	.02	.11	.02	.16	.02
SCM knowledge	.19	.02	.13	.02	-.00	.02	-.03	.00
Main effects								
Majority decision making			-.17	.07	-.12	.06	-.05	.06
Shared task representations			.13	.04	.23*	.03	.14	.03
Leadership ambiguity			-.07	.05	.04	.04	.07	.04
Interaction 2-way								
MDMxSharedTR					.36**	.23	.25*	.23
MDMxLeadAmb					-.14	.22	-.08	.21
SharedTMxLeadAmb					.15	.11	.16	.11
Interaction 3-way								
MDMxSharedTRxLeadAmb							.32**	.54
R^2	.09		.14		.36		.42	
ΔR^2	.09		.05		.21		.06	
ΔF	1.47		1.49		7.70***		7.15*	
dfs	(5, 75)		(3, 72)		(3, 69)		(1, 68)	

Note. N = 81 teams; *p < .05; **p < .01; ***p < .001; two-tailed; Total R = .65 for model 4; SCM = Supply Chain Management; MDM = Majority decision making; ROI = return on investment

Figure 1.JPEG

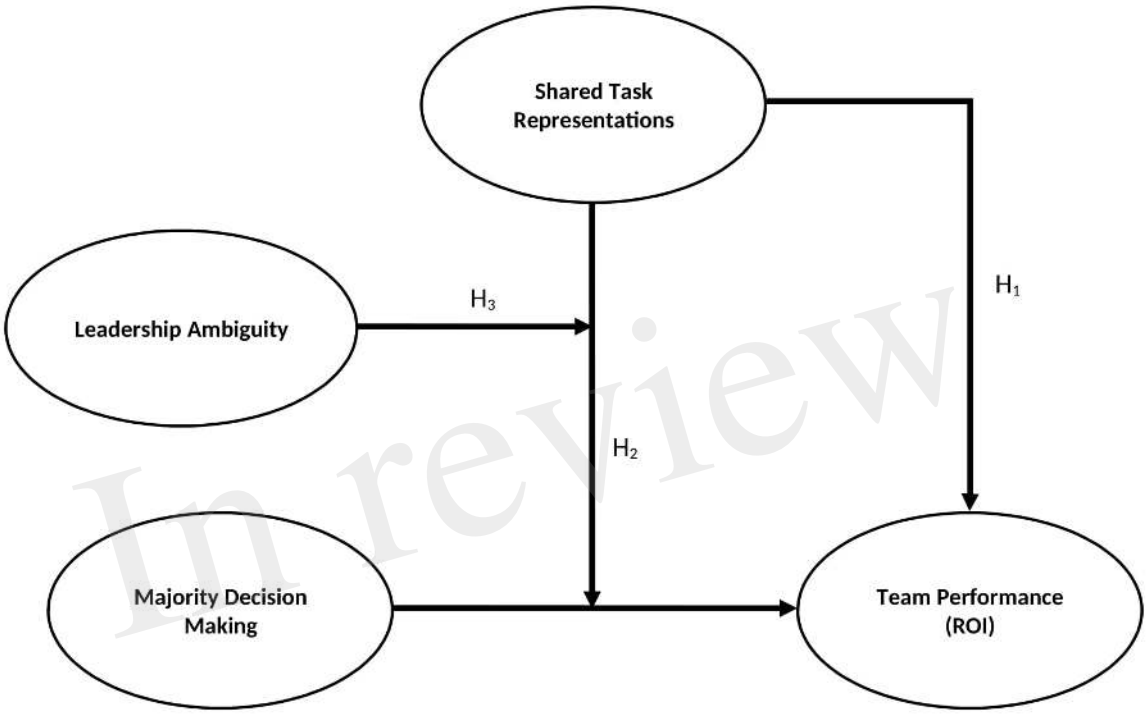

Figure 1: Research model of hypothesized links between majority decision making and team performance in the game (ROI) and the moderating effects of shared task representations and leadership ambiguity. Note that the hypotheses build on each other, H3 includes the whole figure with all variables.

Figure 2.JPEG

Figure 3.JPEG

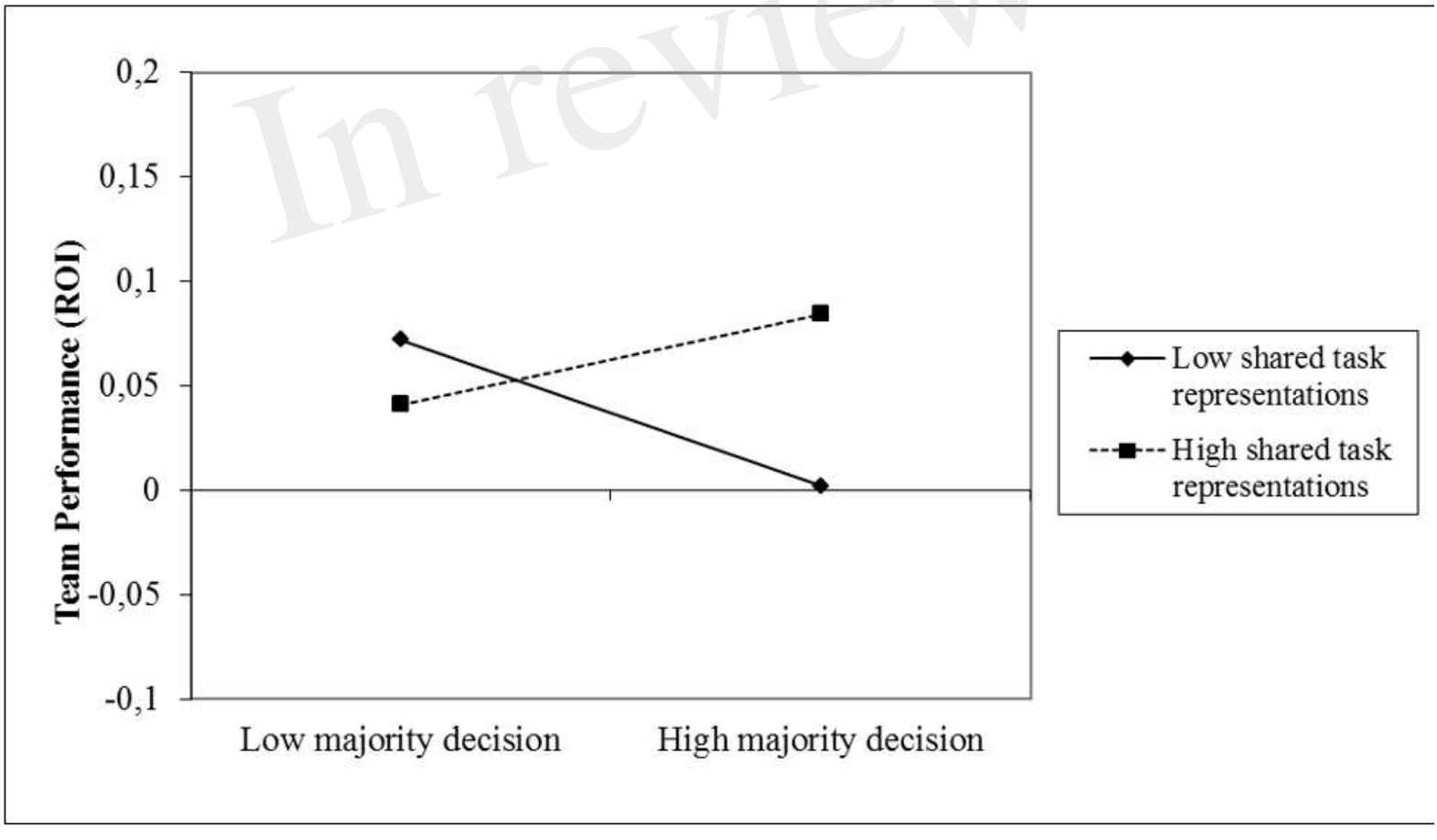

Figure 4.JPEG