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ATTRIBUTIONS FOR TEAM MEMBER CHANGE AND THE RESULTING FLUX ON TEAM COORDINATION PROCESSES AND EFFECTIVENESS

By

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ABSTRACT

This dissertation hypothesizes the effects of membership change within teams on team coordination and effectiveness. When member change occurs, teams are likely to make attributions relating to how unexpected is the member change, based on the predictability and controllability of that change. The impact of the change (i.e., based on the unexpected nature of that change) on team coordination can be described in terms of flux (i.e., the amount of disruption caused by member change in coordination), and thus, team effectiveness. The membership change and flux-in-coordination relationship is then moderated by the importance of the member leaving the team, referred to as role criticality. The contributions and limitations of these results are discussed, as are directions for future research and practical implications.

CHAPTER ONE
INTRODUCTION

OVERVIEW OF RESEARCH STUDY

The concept of teamwork is based on the notion that individuals working collectively are able to accomplish something beyond the capabilities of those individuals working single-handedly (Marks, Mathieu, & Zaccaro, 2001). Many advantages arise out of the concept of teamwork, such as increased productivity, innovation, and employee satisfaction (Katzenbach & Smith, 1993; West, Borrill, & Unsworth, 1998). Therefore, many organizations have implemented team-based work structures as a way to survive and compete more effectively in economic environments that increasingly are characterized by uncertainty and escalating levels of competition (Sundstrom, 1999). In fact, the past two decades have observed an astonishing conversion from individual- to team-based work structures in organizations (Devine, Clayton, Philips, Dunford, Melner, 1999; Gerard, 1995), as much research has theoretically conjectured and empirically examined teams in work contexts.

However, organizational teams most often are studied cross-sectionally, with changes within the team frequently ignored (Arrow, McGrath, & Berdahl, 2000). More recently, research has begun to investigate change in team settings (e.g., see Beersma, Hollenbeck, Conlon, Humphrey, Moon, & Ilgen, in press; Choi & Levine, 2004; DeRue, Hollenbeck, Johnson, Ilgen, & Jundt, 2008; Gruenfeld, Martorana, & Fan, 2000; Kane, Argote, & Levine, 2005; Liljenquist, Phillips, & Neale, 2003). However, examining the temporal effects that change has on both team processes and outcomes requires more in-depth research to shed light on this phenomenon.

Thus, the following research question is posed: How do changes in membership impact a team's ability to effectively synchronize its behavior via coordination as the member change becomes more unexpected? More specifically, this dissertation examines the impact of team member attributions relating to the level of unexpectedness (i.e., based on the perceived controllability and predictability of the member change) on the team's ability to coordinate its behavior. The impact of membership change on coordination is described in terms of flux (Summers, Humphrey, & Mishina, 2009), or how much disruption the team experiences in its coordination mechanisms as a result of change. Furthermore, this relationship is then moderated by the importance of the member leaving the team, referred to as role criticality (i.e., the notion

that some roles within the team exercised a disproportionate influence on team performance, Humphrey, Morgeson, & Mannor, 2009). Finally, flux in coordination's meditating effect on team effectiveness also is hypothesized.

Scholars have offered different views of what change does, and how it affects organizations, groups, and individuals. Some have argued that change is detrimental because it disrupts internal processes and external linkages (e.g., Hannan & Freeman, 1984). Others have argued that change can be both a disruption and / or a powerful adaptive force (e.g., Amburgey, Kelly, & Barnett, 1993). In either case, scholars appear to agree that change causes some sort of disruption or flux (i.e., an unstable, unbalanced, or changing pattern of interaction among members, Summers et al., 2009) within systems (Arrow & McGrath, 1995). As Arrow and McGrath (1993: 386) noted, "continuity routinizes; change perturbs."

Teams can change for numerous reasons. For example, team members can quit, retire, earn a promotion, and so forth. Teams sometimes utilize job rotation, which requires members to take on new responsibilities. Also, teams can change to adapt to their task environment or changes in technology. The focus of this dissertation is on changes in team membership. *Member change* occurs when newcomers join a team, or one or more members leave the team (Ziller, 1965). For example, the literature on team member change has tended to assume that all roles are equivalent across team members, and that team member roles do not change while members are changing (e.g., Choi & Thompson, 2005). Hence, member change is viewed as something similar to the changing of a light bulb or fuse; that is, a new (nearly identical) body is plugged into an existing role, but nothing else is fundamentally different.

When examining a team's response to membership change, it seems likely that their perceptions or attributions concerning the catalyst behind the change event also would be important. A team's ability to successfully adjust to member change varies with how unexpected is that change. The extent to which the change event is unexpected is based on two factors: (1) controllability (i.e., the extent to which an individual perceives a situation to be under his / her own volition or influence) and includes "the expectation of having the power to participate in making decisions in order to obtain desirable consequences and a sense of personal competence in a given situation" (Rodin, 1990: 4); and (2) predictability (i.e., the extent to which a situation or event is foreseeable) (McGrath & Beehr, 1990). This is directly related to the attributions that both the team and team members make for the change event, because perceptions of the

controllability and predictability of change events often influence individual team members as well as a team's ability to cope with the flux created by team member change.

Additionally, these attributions are expected to influence both team processes and outcomes. Processes are the means by which team members interact with each other in order to accomplish tasks and goals (Marks et al., 2001), and thus represent an integral facet of team effectiveness (LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). The team's literature has identified many processes that teams enact in order to complete tasks, deal with social relationship issues, and interact with the external environment (for a review, see Rousseau, Aube, & Savoie, 2006; for a meta-analysis, see LePine et al., 2008). Although many, if not all, processes are likely to be affected by changes experienced by teams, this dissertation focuses on the process of coordination (i.e., the process of managing interdependencies between activities and work flow, Malone & Crowston, 1994).

Also, the importance of the position or roles that are being changed within the team will impact differentially the attributions team members make regarding member change, and their ability to manage the disruption or flux caused to coordination. Thus, role criticality (i.e., the notion that certain roles within teams are more significant than others and, consequently, exercises a disproportionate influence on a team's effectiveness, Humphrey et al., 2009) is the moderator of interest in this dissertation. Furthermore, if these various forms of change affect coordination, then team outcomes also will be differentially impacted. Thus, the outcome of interest is task performance.

Purpose and Intended Contribution of the Research

This dissertation presents several contributions to the team's literature. By examining membership change, this dissertation adds to the extant team's literature in several ways. First, it examines the effects of team member change longitudinally. Second, it examines how teams react (i.e., amount of flux in coordination) to a range of changes based on how unexpected they are, thus contributing to the team's literature. Third, investigating the effects of the aforementioned member change on coordination and various measures of team effectiveness have important implications for the effects of change on teams' ability to successfully adapt their patterns of interaction to new contexts and environmental demands (i.e., adaptive performance, managing conflict). Fourth, this research empirically expands the notion of role criticality in

team functioning. Last, the proposed research synthesizes and expands upon the literature of temporal and change issues within team contexts.

Organization

This dissertation theoretically develops and empirically tests the effects of intentional member change by focusing on team attributions for member change based on controllability and predictability. Specifically, this dissertation (1) reviews and synthesizes the literature (2) develops a theoretical framework for team attributions regarding membership change; (3) empirically examines the impact on team processes and outcomes; and (4) discusses theoretical and practical implications of the findings.

This dissertation is organized as follows. Chapter 2 presents a review of the literature on the temporal and change issues within teams, coordination and outcomes, equilibrium, flux, routines, and role criticality affecting team functioning. In Chapter 3, theory is described and developed to explain how team attributions for member change impact the amount of flux teams experience in coordination, and how the flux in coordination affects team effectiveness. In Chapter 4, the research methodology used to test the hypothesized relationships is described. More specifically, I describe the sample, operationalizations of independent, moderator, dependent, and control variables, and the statistical analyses utilized to test the hypothesized relationships are reviewed and described. The results of the data analyses are reported in Chapter 5. In Chapter 6, the findings and contributions of the study, theoretical and practical implications, limitations, and directions for future research are discussed.

CHAPTER 2
LITERATURE REVIEW

Overview of Chapter

Conceptually, team researchers have agreed that teams are complex, adaptive, and dynamic systems, existing in various contexts across time (Arrow et al., 2000; McGrath, Arrow, & Berdahl, 2000). Over time and contexts, teams and their environments continually cycle and recycle as they interact among themselves and with others spanning team boundaries. These interactions cause teams, team members, and their environments to change in more intricate ways than is portrayed by simple cause and effect frameworks (Ilgen et al., 2005). Thus, this review section focuses on three main topics: (1) members and their roles; (2) change and flux; (3) and team processes.

Members and Their Roles

A team is a collection of individuals who are interdependent in their tasks, who share responsibility for outcomes, who see themselves, and who are seen by others, as an intact social entity embedded in one or more larger social systems (e.g., business unit or the corporation), and who manage their relationships across organizational boundaries (Cohen & Bailey, 1997). Moreover, the effectiveness of a team is due, at least partially, to the role performance of individuals in the team. Thus, the following section illustrates the importance of roles, and reviews pertinent literature on roles, role theory, and associated issues with roles, such as role conflict and ambiguity, as well as describes the impact of individual differences on team functioning.

Roles

Role theory is concerned with one of the most important characteristics of social behavior—the fact the individuals act in ways that are different and predictable, depending on their respective social identities and the situation (Biddle, 1986). Parsons (1951; Parsons & Shils, 1951) and Merton (1957) offered classic theoretical discussions of role theory, while an early series of well-recognized studies founded on role theory was that of Gross, Mason, and McEachern (1958), who defined and operationalized several role concepts. Role theory concerns itself with a triad of concepts: (1) patterned and characteristic social behaviors, (2) parts or

identities that are assumed by social participants, and (3) scripts or expectations for behavior that are understood by all and adhered to by performers (Biddle, 1986: 68).

However, most empirical research done in role theory has been generated by researchers interested in the roles of formal organizations, focusing on social systems that are preplanned, task oriented, and hierarchical (Biddle, 1986). Furthermore, from an organizational perspective, it is important to understand how individual contributions and interactions among team members influence team processes and outcomes. Thus, one approach used to conceptualize team member behavior is that of the roles that they perform (Stewart, Fulmer, & Barrick, 2005; Mumford, Campion, & Morgeson, 2006).

A *role* can be described as an expected pattern or set of behaviors (Biddle, 1979), and typically is defined as a cluster of related and goal-directed behaviors characteristic of a person within a specific situation (Stewart, Manz, & Sims, 1999). Teams often utilize differentiated roles for the completion of tasks and work. For example, a team of four professors working on a research project could decide to structure the team such that each member holds a specific role: (1) Theoretician; (2) Study Designer and Data Collector; (3) Data Analyzer; (4) Writer. This type of role differentiation is common in fields outside management and psychology (e.g., physics, fisheries and wildlife, etc).

In this case, each team member is responsible for a set of goal-directed behaviors that work in conjunction to complete a task. Thus, roles are frequently regarded as one of the fundamental and defining characteristics of organizations (Katz & Kahn, 1978) and teams (Hackman, 1990a), and the fulfillment and coordination of these roles by team members is hypothesized to be essential for team effectiveness, and to avoid process loss associated with dysfunctional conflict, role ambiguity, and social loafing (Steiner, 1972).

According to Mumford et al. (2006), the use of the role construct offers several advantages for understanding how individuals contribute to teams. First, roles have been considered as one of the essential characteristics of work teams (Hackman, 1990b; Sundstrom, de Meuse, & Futrell, 1990), and are frequently cited as influential determinants of team effectiveness (Belbin, 1993). Second, the conceptualization of a role highlights the notion that individuals perform differentiated but complimentary components within a team, including taking situational and social cues into account and enacting the pertinent role (Mumford et al., 2006). Third, the concept of a role is more dynamic and adaptable than the traditional concept of

tasks / jobs, which is more congruent with the current conceptualization of adaptive work environments (Griffin, Neal, & Parker, 2007; Ilgen & Hollenbeck, 1991). Fourth, the role knowledge construct provides a valuable alternative to personality for discerning the contributions members make to the team, as roles provide a more relevant explanation that corresponds to a team's needs with regard to task, social, and boundary-spanning functions (Mumford et al., 2006).

Furthermore, the role composition approach considers how role holders' characteristics influence effectiveness, rather than focusing exclusively on individuals. Because multiple team members usually fill a particular role, roles exist at a level lower than the team, but higher than the individual. This approach borrows several compositional cues from the additive (i.e., models wherein the mean level of the individual attributes in a team is taken to represent the team, Chan, 1998) and dispersion (i.e., models that account for differences or similarities between team members, Chan, 1998) models, in that individual attributes can be conceptualized at the role level as the average or diversity of the role holders' characteristics (Morgeson & Humphrey, 2008). However, this approach adds a level of complexity, in that different roles may differentially impact team performance (Humphrey et al., 2009; Pearsall & Ellis, 2006).

Extant literature also has made contributions towards the idea of team roles as several of these conceptualizations can be found in the organizational and social psychology research literatures (Mumford, Van Iddekinge, Morgeson, & Campion, 2008). The work done by Benne and Sheats (1948) was the first, and possibly the most encompassing, work done on team roles. These researchers suggested a typology of 27 team member roles, which were then classified into three categories. Task roles are related to the completion of the team's tasks, which coordinates team effort in selecting, defining, and solving common problems. Maintenance roles are oriented towards strengthening, regulating, and perpetuating the team as a team (i.e., viability). Lastly, individual roles are taken to satisfy individual needs unrelated to the team's task. Likewise, Bales and colleagues (Bales, 1950; Bales & Slater, 1955) categorized the various behaviors exhibited by individuals in small team settings, which resulted in 12 behavioral categories, six that exhibited task-related activities (e.g., giving opinions) and six that exhibited socioemotional activities (e.g., releases tension).

More recently, Belbin (1981, 1993, 2001) identified seven roles, building on work done with executive management teams (e.g., Belbin, Aston, & Mottram, 1976) labeled as the team

role model. A team role is defined as a pattern of behavior characteristic of the way in which one team member interacts with another in order to facilitate the progress of the team as a whole. These roles included asking, informing, proposing, opposing, delegating, building, and commenting. His approach differs from the traditional psychosocial approach (Biddle, 1979; Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964) in that the expected behavior does not come solely from the position occupied by the individual, but from a constant negotiation process among team members. This perspective reflects a negotiation process among individual competencies, and the team's needs that defines the way in which each team member adjusts to the team by displaying a specific role (Aritzeta, Ayestaran, & Swailes, 2005).

From yet another perspective, using data from project development team leaders and members, Ancona and colleagues (Ancona, 1990; Ancona & Caldwell, 1988, 1990, 1992a; Gladstein, 1984) identified functional activities that team members employ linking the team with their external environment. This research revealed four main factors, which the researchers labeled consul (i.e., buffering and representational activities), task coordinator (i.e., coordinating technical or design issues), scout (i.e., general scanning for ideas and information), and guard (i.e., avoiding releasing information).

Furthermore, several practitioner-oriented team role typologies exist in the literature. McCann and Margerison (1989, 1995) used interviews with teams to develop a model of eight roles located across four dimensions. These roles were labeled relationships (i.e., extroversion-introversion), information (i.e., practical-creative), decision-making (i.e., analytical-beliefs), and organization (i.e., structured-flexible). Parker (1994, 1996) suggested a comparable set of four team player "styles" that correspond to preferences that team members have for interacting within team settings, which include: contributor, collaborator, communicator, and challenger.

Utilizing qualitative research, Barry (1991) recognized four types of "distributed leadership" that self-managed teams need. These comprise envisioning leadership (i.e., creating new and compelling visions), organizing leadership (i.e., imposing order on the team's task), spanning leadership (i.e., facilitating the activities that link the team with the organization), and social leadership (i.e., developing and maintaining the team socially and psychologically). Finally, DuBrin (1995) proposed 10 "team-enhancing" roles: process observer, knowledge contributor, listener, people supporter, challenger, summarizer, collaborator, conciliator, mediator, and gatekeeper.

In sum, both Beene and Sheets (1948) and Bales (1950) developed two significant functions that roles are instrumental in performing: (1) task execution and (2) the maintenance of social viability of the team. Additionally, their research demonstrated the utility of using the role construct to cluster behaviors displayed by a team. Research conducted by Belbin (1981, 1993), McCann and Margerison (1989), and Parker (1994, 1996) underscores the value of using individual differences as predictors of which roles individuals are likely to acquire within teams. These typologies are founded on Jung's (1923) theory of personality, and classifies individuals with regard to their "role preferences." Lastly, Ancona and colleagues (e.g., Ancona 1990; Ancona & Caldwell, 1988, 1990, 1992a) highlighted the importance of team roles that bridge the boundary between a team and its external environment.

Collectively, understanding team roles allows researchers to delineate the various functions necessary for outlining how team members should interact in order to complete tasks, refine interpersonal relationships, and manage external constituents. Additionally, if these functions or behaviors can be delineated, then certain roles can be identified that are more important to the functioning of the team. In fact, Humphrey et al. (2009) have done just that by developing the idea of the strategic core within teams.

Role Criticality

To further expand on the notion of roles, recent research has suggested that certain roles are more critical ("strategically core") than are others to team performance. Role criticality is the notion that certain roles within a team exercise a disproportionate influence on the team's performance (Humphrey et al., 2009; Pearsall & Ellis, 2006). Building on previous research that has identified the outsize impact of a subset of a collective, Humphrey et al. (2009) and Pearsall and Ellis (2006) argued that specific roles are more critical for the success of a team. More specifically, Humphrey et al. (2009: 51) defined the strategic core as "the role(s) on a team that (1) encounter more of the problems that need to be overcome in the team, (2) have a greater exposure to the tasks that the team is performing, and (3) are more central to the workflow of the team".

Pearsall and Ellis (2006) also empirically demonstrated that the characteristics of those team members filling highly critical roles were more strongly related to the overall performance of the team than the characteristics possessed by team members filling other team roles. More specifically, they found that critical team member dispositional assertiveness positively impacted

team performance and satisfaction, and that those effects were mediated by transactive memory. Dispositional assertiveness is the aspect of extraversion most closely tied to the effective communication of ideas, as assertive individuals tend to speak forcefully and without hesitation (Costa & Widiger, 1994). Thus, individuals occupying critical positions must be willing and able to share knowledge in order for their teammates to quickly and clearly receive specific task-related information.

Humphrey et al. (2009) tested their theory of the strategic core by examining 29 years of Major League Baseball. Their results showed that high levels of experience and job-related skill are valuable predictors of team performance. However, the relationships between these constructs and team performance are significantly stronger when these characteristics are possessed by core role holders (i.e., as opposed to non-core role holders). Moreover, they observed that teams that invest more of their financial resources into core roles are able to leverage such investments into significantly improved performance. These results propose a new method for regarding individual contributions to a team's success by shifting the focus onto core roles.

Although research in this area is just developing, the notion of role criticality or strategic core of teams is an important concept that needs further empirical testing as well as expanding the concept theoretically. Thus, this dissertation utilizes role criticality as a moderator to help explain the relationship between team attributions for change and coordination processes.

Change and Flux

Because teams do not exist in a vacuum, understanding that dynamic influences constantly impact a team's structure, members, and environment is paramount for discerning how teams develop patterns of interaction among roles, members, and their environment. Thus, group change theories are introduced, a review of the literature on team member change and turnover follows, and team adaption establishes a foundation for examining the effect of member change on a team's equilibrium (i.e., where teams enter a state of flux).

Change

Change is an inevitable phenomenon that exists within team contexts, and a central position of this dissertation. Thus, this section first explains and reviews literature on group change theories. Then, it describes membership change and turnover as well as team adaption.

Furthermore, because this dissertation concerns itself with responses to change, relevant literatures on perceptions and reactions to change as well as attribution theory are reviewed.

Group change theories. Perhaps one of the most prevalent theories is that of Arrow and McGrath's (1995) membership dynamics in groups at work, which consists of the patterns of change and continuity that arise as members move in and out of a team, or among roles and status levels within the group. Their theoretical explication for understanding group dynamics underscores three system levels: member, group, and organization, with two dynamic interchanges within these three levels: member→group and group→organization.

Groups that continue with relatively few or minor changes tend to develop, and hold to, habitual routines (Gersick & Hackman, 1990) that become part of the structure of interaction. These routines define the dynamic equilibrium state of the group-as-a-system, and maintaining that state is crucial for the well-being of the team. Stable composition, role, status, and interaction patterns make for constant patterns of member production, member support, and group production. Thus, continuity increases the "team-like" characteristics within the team, and the more continuity a team has experienced, and the stronger its expectations about future continuity, the stronger the immediate effects of any given change (Arrow & McGrath, 1995).

In contrast, teams that undergo change necessarily experience some degree of disturbance (i.e., flux) to their habitual routines. The less developed the set of relations and continuity among members, the less effectively the team can adapt to change, especially if it is unexpected (Arrow & McGrath, 1995). Essentially, change is a disruptive event whereby team functioning can be impaired by violations in team norms, disturbing the normal task cycle (Morgeson & DeRue, 2006). This is likely to affect member production, members support, and in turn, production (Arrow & McGrath, 1995).

Furthermore, Arrow and McGrath (1995) argued that team members are not interchangeable, as they differ in knowledge, skills, and abilities, experience, age, gender, and other characteristics. Nearly all teams have formal and informal role and status differentiation, and many teams have relatively fixed divisions of labor, limiting the substitutions or exchanges that are possible or effective. For example, a registered nurse in a Trauma Resuscitation Unit (TRU) could neither absorb the role or fill-in for the attending surgeon (Klein, Ziegert, Knight, & Xiao, 2006). Nor could every member be an effective informal team leader. Also, some team members are high-status, central, and important to team functioning, whereas others are more

peripheral and less important to team functioning. Changes involving more central roles should demonstrate stronger effects on team interaction and effectiveness than changes involving more peripheral members (Arrow & McGrath, 1995).

Arrow and McGrath (1995) conjectured that the impact of change depends on where the impetus for change originates, because change can be initiated by individual members, by the team as a whole, or by "outsiders" such as supervisors. This dimension is important because rationale supports that it makes a difference. For example, making an individual bid to lead the team, being nominated for leadership by the team, and being appointed the team leader by management all represent different events, even though they may seem on the surface to result in the "same" event. However, teams are likely to react differently to change depending on who initiated the change, what their rationale was, and how acceptable that rationale was to the team as a whole.

Moreover, if the team tries to change its core team or its membership, the team typically is attempting to do so in response to some issue or opportunity observed by that team. However, if external agents force change on a team, such change is apt to reflect a response to an issue or opportunity viewed from that external perspective. Problems arise when the team does not agree with the decision of the external agent, and then resents the change, which can disrupt role and status relationships, damage team well-being, and negatively impact other system functions as well (Arrow & McGrath, 1995).

Furthermore, a fundamental element of this theory is what Arrow and McGrath (1993) called the *arithmetic of change*. Without a doubt, with respect to team functioning and effectiveness, one member leaving or joining the team may not be equivalent to two or more members either joining or leaving a team of four, and the significance of comparable changes would differ in teams of six or eight members. Likewise, from the individual member's point of view, the behavior of newcomers joining one by one will be different from that of those who arrive in large numbers, and the process of socialization in the team also will be different in one case and the other, as noted by socialization theorists (e.g., Anderson & Thomas, 1996; Levine & Moreland, 1994; Moreland, 1987; Moreland & Levine, 1982, 1988, 1989). The same can be said with regard to team roles and the magnitude of role change. One role being changed likely has a much different impact on team functioning than does everyone in the team changing roles.

However, they noted that neither continuity nor change is regarded as a generically desirable or undesirable state. Change may disrupt efficient team functioning, but because continuity unavoidably creates routinization, change is always a mixed blessing. Whereas some reduction in variability is necessary for efficient coordination of behavior, if the pattern of relations and activities that define the group-as-a-system becomes fixed and invariant, the team may be unable to adjust to changes in its environment. Indeed, frequent adjustments in response to environmental changes may keep a team flexible, and better able to make the big adjustments that are necessary in times of crisis (Arrow & McGrath, 1995).

From a more sociological perspective, Carley (1991) proposed a theoretical framework for a group's ability to successfully manage the addition of new team members, as well as create change to form a more effective team. In her theory of group stability (1991), factors such as group size and duration, culture, and information exchange impact a group's reconstructive capability. Group members repeatedly engage in a cyclical process of interacting, exchanging information, learning, adapting their behavior, interacting, and so on. In addition, as changes occur to the group, the stability of the group often is regarded as depending on the group's ability to "reconstruct" itself.

More specifically, groups that are the most stable in the short run (i.e., when no new people enter or when no new pieces of information are introduced), may not have the best reconstructive ability in the long run. Small groups are the most stable in the short run, but large groups are more reconstructive in the long run when new people enter. Large groups are less durable because with more members there are more links to the outside and thus more ways group culture can diffuse. Large groups are more reconstructive because there are more people to interact with, and to "socialize" the new member to the group's culture. Groups with less complex cultures are more reconstructive in the long run when new people enter, and less stable in the short run. A simpler culture contains fewer facts; hence, there is less for both the new person and for the other group to learn (Carley, 1991).

Overall, group change theories theoretically have explicated (1) the effects of change on group interaction and (2) several contingencies that affect a group's ability to manage change. Arrow and McGrath (1995) have emphasized that the impetus for change is an important concept when discussing change but then do not further elaborate. Thus, this dissertation builds upon

their work by developing and testing hypotheses regarding the impetus or attributions for member change.

Member change and turnover. Membership change occurs when newcomers join a team, or one or more members leave the team (Ziller, 1965). For example, membership change may occur as a result of turnover, promotions, reassignments as part of larger restructuring efforts, or changes to project tasks or scope. Events such as these severely affect the social relationships in a team, the structure and content of the team's processes, and consequently, team effectiveness (Levine et al., 2003).

In regards to group membership change, McGrath, Arrow, Gruenfeld, Hollingshead, and O'Connor (1993) found that groups did better on the course essays in weeks in which they underwent member changes, compared to weeks in which they had less change, or more membership continuity. This was true for both externally initiated changes involving member substitution as well as member initiated changes. Thus, they concluded that membership change produced a greater focus on the task and a lessened focus on conflict, and those conditions were associated with higher levels of performance on the groups' essays; the task activity most directly connected to students' success in the course. However, they found that membership changes with groups working on computer-based tasks was associated with lower levels of performance.

In their examination of predicting top management team turnover, Wiersema and Bantel (1993) investigated links between the firm and its environment. They found that the best predictors of top management team turnover are environmental (i.e., lack of munificence, instability, and complexity). These environmental conditions represent a difficult and stressful context for executive decision making that is likely to be unsustainable for a long period of time. Top managers leave their firms as they experience stress, threats to their power, outdated perspectives, conflict, and challenge.

De La Hera and Rodriguez (1999) investigated the effects of magnitude and frequency of membership changes in groups. Although many of their results were not statistically significant, they discovered the positive effects of member change of greater magnitude (100%) as opposed to compositional stability in terms of the quality of productive results for teams performing organizationally relevant tasks.

Bayazit and Mannix (2003) examined team demographic diversity, perceived team efficacy, intrateam conflict, and perceived team effectiveness as predictors of members' intentions to remain with their team, a form of behavioral commitment. The results indicated that the absence of relationship conflict, but not task conflict, in the team, individual beliefs about the efficacy of their team, and perceived effective team task performance were the strongest predictors of team members' willingness to stay with their team. Team age and nationality diversity affect members' desires to stay with their team via their effect on team relationship conflict. Additionally, their results suggest that apart from the heterogeneity in team demography, the KSAs of individual team members also are important for the viability of the team. When team members feel that their team is competent at the initial stages of team development, they are more likely to desire to stay with their team.

Chen's (2005) study investigated the antecedents and consequences of newcomer adaption in teams. He found that newcomer performance was found to be malleable during an early transitional period, when employees were required to adapt existing skills to meet new work demands. However, performance became more stable later on, after newcomers had adapted better and transitioned into a maintenance work period. Furthermore, qualifying Chen and Klimoski's (2003) findings, initial newcomer empowerment and team expectations predicted initial performance, but not performance improvement. These results imply that, although team performance enables and / or drives newcomer adaption, the benefits associated with joining more effective teams may not be realized early in socialization. In contrast, motivational processes (i.e., captured by newcomer empowerment) and team expectations are more likely to impact initial levels of performance.

Lewis, Belliveau, Herndon, and Keller (2007) analyzed the effects of group membership change on group cognition and performance to determine how groups can simultaneously leverage existing members' collective knowledge and a newcomer's expertise via two components of transactive memory systems (TMS): TMS structure and TMS processes. Their research revealed that TMS structure stability and efficiency of TMS processes are not necessarily positively related as the stability of members' cognitive structures and the group's transactive processes exerted more influences on group performance.

Lastly, DeRue et al. (2008) examined the effects of three structural downsizing approaches (i.e., Eliminating Hierarchy, Maintaining Hierarchy, Integrating Hierarchy) on teams.

They found that the Eliminating Hierarchy teams adapt to the downsizing by engaging in quantitative behavioral change, and increasing their effort directed at task-related behaviors. This differs from downsizing approaches that retain the leadership hierarchy, or incorporate the leader into the team. These approaches to team downsizing (i.e., Maintaining Hierarchy, Integrating Hierarchy) do not utilize the same degree of recomposition in the team, and as a result, teams utilizing either a Maintaining or Integrating approach to team downsizing do not engage in the behavioral changes necessary to effectively adapt to the downsizing. Furthermore, they found that team-level emotional stability improved the performance of Eliminating Hierarchy teams.

Overall, membership change can demonstrate a positive or a negative effect on team functioning and performance (Arrow & McGrath, 1993, 1995; Lewis et al., 2007). It can be detrimental to the extent that it forces members to spend time and effort socializing new members (Arrow et al., 2000; Levine & Moreland, 1999; Moreland & Levine, 1989), and disrupts members' routines and patterns of interaction for interacting and accomplishing their tasks (Goodman & Leyden, 1991; Pisano, Bohmer, & Edmondson, 2001). Membership change can improve team functioning and performance by readdressing team strategies regarding tasks (Choi & Thompson, 2005), increasing diversity or appropriateness of the team's knowledge base (Levine et al., 2003; Lewis et al., 2007), enhancing innovative thinking (Choi & Thompson, 2005), or stimulating members to contemplate functional changes to the team's patterns of interaction (Kane et al., 2005; Levine & Choi, 2004).

However, to date, there have been no attempts to conceptualize the effects of change on systems (e.g., teams). Prior research has described the varying effects of change, but has not theoretically expanded on the impact of change—only the results that change has on systems. Thus, the concept of *flux* is proposed for examination, which describes the state of disruption or instability that teams enter as a result of change.

Responses to change. The impact of change varies in how unexpected they are (McGrath & Beehr, 1990). Changes that are part of a pattern (e.g., a trend or cycle) can be predicted once the pattern is discerned. Other events may be predictable because team members have been informed directly about an impending change in the embedding context (Arrow et al., 2000). In their analysis of environmental circumstances that cause human stress, McGrath and Beehr (1990) distinguished *stress-potential environmental circumstances* or *stress-producing events and conditions* (SPECs), according to the two factors of predictability and controllability.

Ordinarily, adaption is easiest when interventions or other meaningful changes in embedding systems are high on both factors, and hardest when they are low on both factors.

The predictability and controllability of events affect the nature of a team's response to changes in embedding context. Specifically, these factors constrain the temporal aspects of a team's response to change (Arrow et al., 2000). McGrath and Beehr (1990) proposed a temporal typology that distinguishes between team responses at five different temporal locations: (1) preventive coping is response to change long before it occurs, (2) anticipatory coping is response to a change before it occurs, (3) dynamic coping is response contemporaneous to the change, (4) reactive coping is response after the event, and (5) residual coping is response long after the change.

Of course, objective predictability and controllability is not the primary concern here; it is the perception of these dimensions that are more important, because individuals respond on the basis of their perceptions of reality, not necessarily reality per se (Lewin, 1936). Moreover, Porter (1976) argued that perceptions are important to investigate even if they reflect misperceptions of actual events. Thus, the attributions of controllability and predictability that team members make are the impetus of this dissertation, as they are hypothesized to affect the nature of a team's action towards membership change (Arrow et al., 2000).

Attribution theory. Attributions are causal explanations (Martinko, 2004). The original work on attribution theory was motivated by Fritz Heider (1958), and driven by the metaphor that the person is a naïve psychologist, using attributions as a causal sense-making mechanism. This process becomes much more evident and relevant when individuals are subjected to important, unexpected, novel, or negative events (Weiner, 1990; Weiner & Graham, 1999), in that individuals are much more likely to engage in rational and systematic information processing (Weiner, 1985). Moreover, Kelley and Michela (1980) have remarked about the numerous variations of attribution theory, but the majority focus on either the information processing required to make an attribution (Kelley, 1973) or the consequences of attributions (Weiner, 1986). Thus, events such as membership change, which at times could be described as surprising or unexpected, definitely could be categorized as such, and would elicit the attribution process (Martinko, Douglas, Ford, & Gundlach, 2004).

One of the basic premises from attribution theory is that individuals have a need to see the world as predictable and controllable (Heider, 1958). According to Weiner (1995), individual

perceptions are influenced by variables that are reasonably well established, such as freedom of choice, personal controllability, intentionality, foresight, and ability to tell right from wrong. Weiner's variables are not dissimilar from the controllability and predictability dimensions of McGrath and Beehr (1990), as Weiner (1995; 2004) explicitly includes controllability while foresight is parallel with predictability. Thus, these two dimensions appear to be particularly relevant when discussing membership change.

The controllability dimension is distinguishable among the other attribution dimensions, due to its volitional nature. Weiner (1985) observed five empirical studies that identified controllability as a causal dimension, and concluded that it should be included in the causal analysis of attributions. A criticism of controllability as an attributional dimension is that it may not be completely independent of the locus of causality dimension (Kent & Martinko, 1995), as Russell, McAuley, and Tarico (1987) reported a high correlation between the two dimensions on the CDS (Causal Dimension Scale). However, a different study by Russell et al. (1985) found locus of causality and controllability on the CDS to be uncorrelated (r = -.05, *n.s.*). To rationalize this discrepancy, Russell et al. (1987) proposed that the relationship between locus of causality and controllability ultimately boiled down to the context being studied, as they expected the dimensions to vary from situation to situation.

The predictability dimension has not garnered the attention that controllability has, though it is important nonetheless. Weiner (1995) described the importance of foresight or predictability when perceiving events, especially novel or unexpected events. Other research has examined the predictability dimension as it relates to specific attributions, such as ability, effort, luck, chance, and mood (Chandler & Spies, 1984). More recently, Gold and Shaw (1998) examined the perceptions of causality on various outcomes, including predictability and controllability, and concluded that participants favored explanations that showed predictability and control.

Flux

The term "flux" has been used to describe a state of fundamental change (Plowman, Baker, Beck, Kulkarni, Solansky, & Travis, 2007). Flux can be thought of as the opposite of equilibrium, which Meyer, Gaba, and Colwell (2005: 458) defined as, "A condition in which all acting influences are cancelled by others, resulting in a stable, balanced, or unchanging system." Building on this definition, flux is defined as "an unstable, unbalanced, or changing pattern of

interaction within a team" (Summers et al., 2009). Thus, when a team experiences member change, the likely result is that the team enters a state of flux.

Flux can be described as an emergent state and not a process. Emergent states are constructs that, "characterize properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes" (Marks et al., 2000: 357). In contrast, processes are defined as, "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing task work to achieve collective goals." Flux does not describe converting inputs to outcomes, but rather affects a team's *ability* to convert inputs to outcomes.

Furthermore, flux can be thought of as the deviations in team processes that result from member change. Inevitably, when member change occurs, teams will undergo some sort of unbalancing or instability to their processes. Specifically, flux is the amount of disruption teams experience to their processes that result from member change. This can build upon what Steiner (1972) referred to as "process loss" due to breakdowns in processes, when teams fall below their estimated productivity level. However, flux is not necessarily a bad thing as stronger and more efficient patterns of interaction can result.

Flux and routines. The longer that teams endure without any major changes to their structure, membership, or environment, the more disruption or flux that results when change does occur (Arrow et al., 2000). This is due to the fact that teams develop routines as team members interact over time. Team, like organizational, *routines* refer to repeated patterns of behavior bound by rules and customs that characterize much of a team or an organization's ongoing activity (Cyert & March, 1963; Nelson & Winter, 1982).

Teams that continue with relatively few or minor changes in membership or roles tend to develop, and hold to, habitual routines, which become part of the structure of interaction (Arrow & McGrath, 1995). Gersick and Hackman (1990: 69) defined habitual routine as "a functionally similar pattern of behavior used in a given stimulus situation without explicitly selecting it over alternative ways of behaving." They proposed several conditions in which habitual routines in task groups are likely to change, including encountering novelty and experiencing failure. Furthermore, Feldman (2000) showed that routines can change when groups spend time reflecting on outcomes of previous iterations of the routines.

Flux and equilibrium. As teams develop and enact routines, they move towards stable patterns of interaction and become more internally consistent (Tushman & Romanelli, 1985), which can be described as moving towards equilibrium (Meyer et al., 2005). As described above, equilibrium is a condition in which all acting influences are canceled by others, resulting in a stable, balanced, or unchanging system (Gersick, 1991), and is contingent on context and environment. Furthermore, change or periods of adaption is expected to affect a team's equilibrium, which likely will increase the amount of flux experienced.

The concept of equilibrium has been used explicitly in the teams' literature by Gersick (1988; 1989), and implicitly by McGrath and colleagues (e.g., Arrow et al., 2000; Arrow & McGrath, 1995). Furthermore, a stream of research also has built upon Gersick's model (e.g., Brett, Weingart & Olekalns, 2003; Okhuysen's, 2001; Zellmer-Bruhn's, 2003). In Gersick's (1988) punctuated equilibrium model, team members' changing assessment of the relationship between the amount of work to be done and time remaining to do it triggers a shift from one state to another. Teams undergoing transition periods, first experience a breakdown of the old equilibrium and a period of uncertainty about the future, before choosing a new basis around which to crystallize a new pattern of interaction (Gersick, 1991). It is during this flux that team members reevaluate strategies in order to reestablish equilibrium; or, as Gersick (1989) described it, teams are presented with two distinct tasks: terminating the old structure and initiating a new one. Here, the member change initiates the termination of the old patterns of interaction, which then leads to initiating new patterns of interaction among team members.

Membership change affecting flux. Flux provides opportunities to improve performance by shaking up processes and routines, creating panic, energizing members, mobilizing advocates for change, and legitimating unorthodox moves (Meyer, et al., 2005). The key term in the prior sentence is *opportunities*, as teams can use times of flux to improve their situations or to fail. In the context presented, flux results as member change alters team members' expectations of others' behavior (i.e., their established patterns of interaction). The team then has to manage this flux by developing new patterns of interaction (i.e., emergent processes) among its members (Summers et al., 2009).

When member change occurs, the initial attention is drawn away from the task at hand, which can direct the team's attention to reevaluate current strategies and improve performance (Tyre, Perlow, Staudenmayer, & Wasson, 1996). By taking advantage of this member change,

teams may become more flexible and perform more effectively (Ancona, 1990; Gersick, 1988; Tyre & Orlikowski, 1994; Waller, 1999). Thus, flux is not inherently negative or positive; it simply describes a state that teams enter as a result of change.

Processes

Processes are the means by which team members interact with each other in order to accomplish tasks and goals (Marks et al., 2001), and thus are an integral facet of team effectiveness. Marks et al. (2001: 357) defined team processes as "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing task work to achieve collective goals." Thus, processes that move teams towards the achievement of collective goals are inherent to existence of work teams (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995; Taggar & Brown, 2001).

One of the most commonly researched processes in teams is coordination, which is the process of managing interdependencies between activities and work flow (Malone & Crowston, 1994). Both small group as complex systems (GCS, Arrow et al., 2000) and entrainment theories (Ancona & Chong, 1996) have specified that coordination is the most critical process for transforming team inputs into team outputs. In addition, a recent meta-analysis highlighted the importance of processes, such as coordination, and found it to positively related to team performance (LePine et al., 2008). However, extant research has not thoroughly examined how coordination is affected as a result of member change.

Coordination

The concept of coordination has appeared in the organizational literature for at least the last sixty years (e.g., Mooney, 1947). For example, Roy's (1960) article, "Banana Time," implicitly addressed coordination issues in his small work group, by addressing such issues as social processes (i.e., socialization of norms) and the patterning of interactions (e.g., routines), which were qualitatively examined and concluded to be an important part of group dynamics. Indeed, the concept of coordination is embedded within team processes, as team effectiveness (Zalesny, Salas, & Prince, 1995) demands that team members coordinate their procedures and reactions in achieving their goals. Moreover, many past models implicitly describe the importance of coordination as a necessary condition for effective team performance (e.g., Gladstein, 1984; Nieva, Fleishman, & Reick, 1978; Salas, Dickinson, Converse, & Tannenbaum, 1992; Shea & Guzzo, 1987; Tannenbaum, Beard, & Salas, 1992).

Marks et al. (2001) defined coordination activities as "the process of orchestrating the sequence and timing of interdependent actions" (p. 368). This refers to the management of synchronous and / or simultaneous activities, and involves information exchange and mutual adjustment of action (Brannick, Roach, & Salas, 1993) in order to align the pace and sequencing of team member contributions with goal accomplishment. This component of teamwork is closely intertwined with the taskwork required of the team (Marks et al., 2001).

For teams to maximize their potential and achieve their goals, the norms and routines have to be structured intentionally (Arrow et al., 2000; Mooney, 1947). Arrow et al. (2000: 106) described that the effective coordination of behavior requires: (1) agreement of who will do what, where, and when; (2) well rehearsed performance habits for individual actions and well-practiced performance habits for each pair or larger subset of members whose actions need to be closely coordinated in time and space; (3) mechanisms for monitoring deviations from the intended "who-what-where-when" of actions; and (4) procedures to correct those deviations.

CHAPTER 3
HYPOTHESIS DEVELOPMENT

The demands organizations must satisfy are dynamic in nature, and rising expectations create a need for continuous improvement in both product and process. Rapidly shifting contingencies, both internal and external, create a need for adaptability (Kozlowski, 1998). As a result, team-based work structures have become a prominent fixture within organizations to accomplish this feat. However, organizational teams do not exist in isolation without any changes to their membership, role structure, task, or external environment. In fact, change is an integral part of a team's life (Okhuysen, 2001). Whether research conceptualizes group development based on a series of stages (Tuckman, 1965; Tuckman & Jensen, 1977), levels of activity (Lim & Murnighan, 1994), or predictable transitions (Gersick, 1988, 1989), change is central to our understanding of teams. Thus, understanding change is critical, because the ability to successfully adapt can pose important consequences for team effectiveness (Ancona, 1990; Gersick, 1988; Waller, 1999).

Here, the specific changes teams experience include changes in its membership, which allow for teams to adapt to new contexts and situations. When member change occurs, disruptions in their patterns of interaction or processes transpire, which is characterized as flux (Summers et al., 2009). The level of flux is contingent on the controllability and predictability of team member attributions resulting from member change.

Tyre et al. (1996) reported that disruptions caused by change can result in temporal shifts in the team that enable to team change in four ways: (1) interruptions act as a trigger that breaks existing behavioral and attitudinal routines opening up the possibility for change; (2) interruptions act as a "timeout" from regular work during which there is time for reflection and planning for change; (3) interruptions act as a coordinating mechanism freeing up all team members simultaneously thus allowing time for collective focus on change, and (4) interruptions act as a signal for management's commitment to change.

Although Tyre et al. (1996) investigated the positive side of change, it is likely that there is also a "dark side." Teams that frequently are interrupted tend to exhibit longer development times, feel frustrated about their progress, and wonder whether management really knows how to manage (Ancona & Chong, 1996). These macro rhythms may break into internal team rhythms,

requiring team members to take time out to figure out how to redirect their energies and how to respond to an external disturbance (Ancona & Chong, 1999). Additionally, if the change is of great magnitude, which results in "extreme destabilization," the team may not have the capability to adjust, thus leading to collapse (Arrow et al., 2000).

Overall, research has demonstrated that change impacts processes and team outcomes. However, the attributions that teams make for the member change also influence the relationships among change, processes, and outcomes. Thus, in this chapter, a model is proposed that attempts to explain team attributions for member change, based on the controllability and predictability of the member change in relation to the unexpectedness of that change, along with the effects that member change exhibit on flux in coordination and outcomes.

As shown in Figure 3.1, the main effects (i.e., controllability and predictability) and interaction effects (i.e., controllability / uncontrollability x predictability / unpredictability) for member change are expected to affect the team process of coordination. The main effects of controllability and predictability on flux in coordination also will depend on the moderating effect of role criticality. Lastly, team performance is impacted by this relationship.

Member Change and Attribution Theory

In general, the impact of change varies as a function of the degree to which the change is or is not expected (Arrow et al., 2000; McGrath & Beehr, 1990). That is, the more unexpected is the membership change, the more flux the team experiences in its ability to coordinate. Changes that are part of a pattern (i.e., a trend or cycle) can be predicted once the pattern is discerned. Other events may be predictable because team members have been informed directly about an impending change in their embedded context (e.g., team leader being promoted to a new management position or the addition of a new customer, Arrow et al., 2000). Consequently, teams' ability to cope with change affects their ability to effectively manage the flux in coordination and, thus, performance.

In their analysis of environmental circumstances that cause stress, McGrath and Beehr (1990) distinguished among different forms of change events according to the two factors of controllability and predictability. Ordinarily, adaption is least complicated when member change is high on both factors, and the most difficult when change is low on both factors (Arrow et al., 2000). However, it is not necessarily objective controllability and predictability that is the concern here; it is the perception of these dimensions that are more important as individuals

respond on the basis of their perceptions of reality, not necessarily reality per se (Lewin, 1936). Moreover, Porter (1976) argued that perceptions are important to investigate even if they reflect misperceptions of actual events. Thus, the attributions of controllability and predictability that team members make are the impetus of this dissertation, as they are hypothesized to affect the nature of a team's action towards membership change (Arrow et al., 2000).

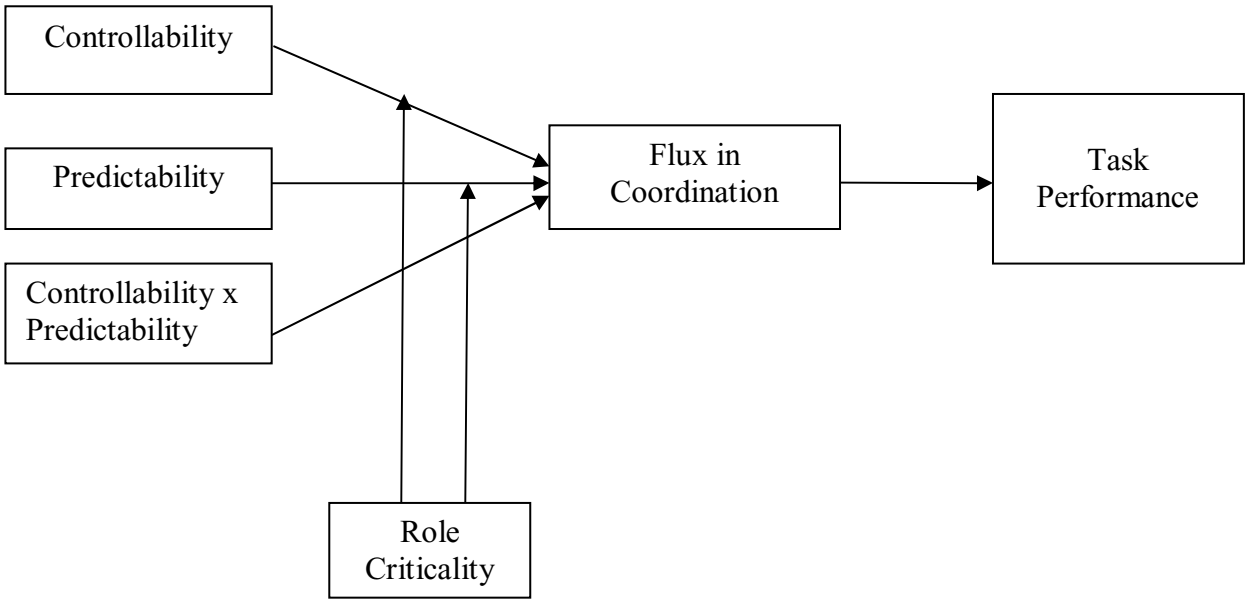


Figure 3.1 Team Attributions for Membership Change

To further elaborate on the idea of attributions, Heider (1958) was one of the first psychologists to observe that individuals try to ascertain the causation of outcomes. Heider viewed this preoccupation with causation as a necessity for evolution and survival, suggesting that an individual's causal interpretation of the world was a primary motivating force for adaptive behavior. Furthermore, Martinko (2004) explained that attribution theory has taken many different forms, which may be confusing at times due to the fact that the 'attribution' is synonymous with 'perception.' However, this problem is more semantics than real because the term almost always refers to perceptions of causation.

The controllability dimension describes the extent to which individuals or groups feel that they can influence or command their environment and surroundings (Skinner, 1996), whereas predictability refers to the ability to forecast the times of occurrence of events (McGrath

& Beehr, 1990), such as member change. It may seem illogical to speak of controlling without predicting, but while it may be possible to control the time of the onset (i.e., of membership change) without being able to predict that time of the onset (i.e., of membership change), it is possible in principle to control (i.e., to prevent or render less likely) the fact of occurrence of the event at any given time, even without being able to predict what the time of occurrence would have been had the team not intervened (McGrath & Beehr, 1990).

Furthermore, the impact of attributions for member change (i.e., inputs) is investigated in this research on the process of coordination. Although theories of team effectiveness have long supported IPO frameworks (Guzzo & Dickson, 1996; Hackman & Morris, 1975), most have been conducted on the process→outcome relationships (cf. Marks et al. 2001; Weingart, 1997 for reviews), with relatively less research investigating to the input→process relationships (Mathieu, Gilson, & Ruddy, 2006). Moreover, Ilgen and colleagues (2005: 520) have contended that IPO models should be expanded to consider "the broader range of variables that are more important meditational influences with explanatory power for explaining variability in team performance and viability." Thus, the controllability and predictability of member change are expected to impact team processes, as the attributions for member change differentially affect how teams can manage these processes.

Marks et al., defines *processes* as "interdependent team activities that orchestrate taskwork in employees' pursuit of goals" (2001: 358). Ilgen et al. (2005) differentiated between classes of mediator variables in IPO frameworks that need to be studied in the team's literature. The effect of team members working together interdependently is that routines form, which refines team members' patterns of interaction. Thus, these meditational processes are important constructs to study with respect to team functioning.

Accordingly, a model is proposed and tested in this research that depicts coordination as a mediator variable linking inputs with processes. More specifically, this research examines how member change impacts coordination of teams by measuring the flux that results from member change. Recall that flux can be thought of as the amount of disruption occurring to team interaction patterns or processes, and expands on what Steiner (1972) refers to as "process loss" due to process breakdowns, when teams fall below their estimated productivity level. Inevitably, when member change occurs, teams will undergo some sort of unbalancing or instability to their coordination patterns.

Coordination and attributions of member change. Marks et al. (2001) defined coordination as "the process of orchestrating the sequence and timing of interdependent actions" (p. 368). This refers to the management of synchronous and / or simultaneous activities, and involves information exchange and mutual adjustment of action (Brannick, et al., 1993) in order to align the pace and sequencing of team member contributions with goal accomplishment. Thus, the longer that teams work together, typically, their coordination patterns become more refined in the form of habitual routines (Gersick & Hackman, 1990).

However, the longer coordination patterns endure, especially if those coordination patterns are dysfunctional, the more difficult it becomes to enact new functional coordination patterns that resolve flux created by member change. In fact, social entrainment theory suggests that once a set of norms and routines have been established within a team, these standards become self-reinforcing, or entrained, so that they often endure over time, even after their operational value has diminished (Bettenhausen & Murninghan, 1985). Thus, the persistence of interaction patterns established earlier in a team's life no longer are operative later in a team's life, which causes considerable problems when the team changes (Kelly & McGrath, 1985).

In this section, the effects of team member attributions on flux in coordination are hypothesized. The attributions of member change impact the flux experienced in coordination. More specifically, the main effect of controllability is first hypothesized, followed by predictability. The impact of the interaction of these two attributions is then hypothesized on flux in coordination.

The perceived controllability of member change impacts a team's ability to resolve the flux in coordination. Controllability represents the extent to which the team feels that they can influence or command their environment and surroundings (Skinner, 1996), which directly effects a team's ability to cope with the flux in its coordination process. The more controllable the member change is perceived to be, the more likely a team can exercise influence on the resulting flux caused by member change. Without control, the team does not have direct influence over its environment, which causes more flux in the team's coordination as the team does not have the decision latitude or autonomy to determine their action regarding the member change (McGrath & Beehr, 1990).

Attributions of control are particularly important for resolving flux as perceived control assists when membership change occurs. By controlling the circumstances surrounding the

member change, teams can have more impact on the resulting flux following the member change by setting up the necessary safeguards. It is often advantageous for a team to be able to postpone the onset of a member change until the team is in better condition to deal with the member change (McGrath & Beehr, 1990).

For example, if a sales team has influence when a team member takes a new position within the company because he / she has an important deal in the works with a major customer, the team's ability to delay that member's transfer could lessen the flux in the team's coordination by delaying the sales person's move until after the deal is completed. The flux would be minimized as the deal would be completed, so the team could focus on socializing the new team member, familiarizing the new member with tasks and technology, and integrating that new member into the team, the organization, and with customers.

If the team had no control over the situation, then the team has to potentially scramble to either integrate a new member into the sales role or compensate for that new member. The possibility of high levels of flux are likely as the customer only may want to work with the prior sales team member, due to mutual respect or rapport. Furthermore, the knowledge of the customer's wants and needs may only be known by the incumbent (i.e., tacit knowledge), which causes the team to scramble to fill the responsibilities created by the departing member.

Thus, a team's ability to either control the onset of the member change or control the context surrounding the change has a direct impact on the flux experienced in their coordination. If the team perceives control when a team member leaves and a new member enters, they can more easily socialize the new team member into their team by bringing him / her into a situation where the transition is more conducive for a new member to enter the team. These situations can be at times where the team can either spend more time socializing and teaching the new member his / her expectations and technical knowledge of their role, or when other team members have enough slack to make up for the lack of knowledge of the new member. Thus, a negative relationship is expected:

> *Hypothesis 1: High levels of member change controllability will result in low levels of flux in coordination.*

The predictability of member change has implications for the flux that member change creates in coordination, as predictability refers to the ability to forecast the times of occurrence of the member change (McGrath & Beehr, 1990). Thus, the predictability of member change

definitely impacts coordination through the flux created via member change. The more predictable member change, the better team members can prepare for inevitable changes in their membership, as the team is not caught 'off guard'.

If team members expect a member change to occur, they can take precautions and setup contingencies to reduce the flux created. This is necessary as Arrow and McGrath (1995) argued that team members are not interchangeable because they differ in knowledge, skills, and abilities, experience, age, gender, and other characteristics. Furthermore, nearly all teams have formal and informal role and status differentiation, and many teams have relatively fixed divisions of labor, limiting the substitutions or exchanges that are possible or effective. Consequently, when team members are prepared for member change, they can develop strategies for establishing new patterns of interaction after the membership change.

For example, if a team member is scheduled to retire (highly predictable), then the team can prepare for the team member's departure, and by noting and learning the departing member's role in the team's coordination process, the team can integrate the new member more quickly and effectively. This can be done by socializing the new member into the existing member's role, as well as increasing helping behaviors to better smooth the transition of the new member into the team. Thus, a negative relationship is proposed between predictability and the flux in coordination:

> *Hypothesis 2: High levels of member change predictability will result in low levels of flux in coordination.*

Lastly, the interaction of controllability and predictability is hypothesized. This interaction results in four possible relationships, starting with those that result in the least flux and ending with the relationship that creates the most flux in coordination processes: (1) controllable and predictable, (2) uncontrollable and predictable, (3) controllable and unpredictable, and (4) uncontrollable and unpredictable.

It is expected that member change that is perceived to be controllable and predictable is similar to planned events, which makes them most manageable (McGrath & Beehr, 1990). Here, the team can plan the member change and then deliver at a time that is more convenient for them, like periods of downtime where the team can take the time to effectively socialize the new member and where the new member can accurately learn the technical aspects of the member's

role. Thus, the flux experienced to coordination is the least in situations that are both predictable and controllable.

Second, member changes can be attributed to unpredictable but controllable causes. Events like these generally do not happen with much frequency (Arrow et al., 2000), so team members often find themselves in unfamiliar situations. Circumstances such as these are likely to create more flux in coordination processes than when the member change is predictable but not controllable.

Next are situations that are perceived to be not controllable but are predictable. These are situations where the team knows when a team member is exiting the team, but cannot control when a new member enters the team. When member change does occur, teams are likely to experience communication breakdowns, and get out of sync with each other which then impacts coordination (Marks et al., 2001).

Lastly, member change that is beyond the control and / or predictability of the team produces another set of dynamic issues. By definition, teams would have to respond after member change has occurred to the composition of the team. For example, McGrath's et al. (1993) longitudinal study of groups looked for evidence of group responses to external interventions that altered the groups' communication media and membership composition. They found that groups reallocated their time to spend more time on task when their membership was altered (Arrow & McGrath, 1993), and that groups displayed increased conflict in response to the change in medium but decreased conflict in response to membership change (O'Connor, Gruenfeld, & McGrath, 1993).

Thus, the more entrained the team is to the established routines and norms, the longer it may take to react to member change as the team may initially turn a blind eye. Teams that continue with relatively few or minor changes in membership or roles tend to develop, and hold to, habitual routines, which become part of the structure of interaction (Arrow & McGrath, 1995). Even when change occurs, the team may not realize it as their routines become so engrained that they endure even when they are harmful to team functioning (Edmondson et al., 2001). For example, teams cannot predict or modify a team member's sudden death or illness or management unexpectedly restructuring the organization. With instances such as these, teams experience member change that is beyond the predictability and controllability of the team.

Furthermore, the very definition of coordination is described as the "the process of orchestrating the sequencing and timing of interdependent activities" (Marks et al., 2001: 368). Thus, when circumstances become less controllable and predictable, a team loses some of its ability to resolve the flux as they could have if they had more controllability and predictability. The less time that teams have to plan out and initiate member change (i.e., unpredictable) and have no control over the member change, the more difficult it becomes to accurately develop new coordination patterns, which likely results in more flux. Thus, a negative relationship is expected between the attributions of controllability and predictability and the flux in coordination (i.e., as attributions for member change are more controllable and more predictable, flux in coordination will be less):

> *Hypothesis 3:The interaction of controllability and predictability will impact flux in coordination such that when the team attributes member change as controllable and predictable the flux will be the least, when the teams attributes member change as controllable and unpredictable the flux will be the next lowest, when the team attributes member change as uncontrollable and predictable the flux will be more than controllable and unpredictable member change, and when the team attributes member change as uncontrollable and unpredictable and the flux will be the most.*

Moderator

Up to this point, the relationships with regards to member change have been hypothesized, not specifying the importance of the position / role being changed. This is an important moderator that adds more explanatory power to the proposed model by explicating how this process changes when critical team roles are being changed. Thus, the moderating effects of role criticality of the membership change on flux in coordination is hypothesized.

Role criticality. This next section hypothesizes the moderating effects of role criticality on the attribution-process relationship. Role criticality is the notion that certain roles within the team exercise a disproportionate influence on a team's performance (Humphrey et al., 2009; Pearsall & Ellis, 2006). Given the relative importance of critical roles in the performance of a team, it appears important to consider how changing a critical role, as opposed to a more peripheral role, impacts team processes. Because some roles within a team demonstrate a more significant impact on a team's success than others (Humphrey et al., 2009; Pearsall & Ellis, 2006), changing those team members who hold these roles will differentially affect the level of flux experienced by a team, and consequently, influence the team's ability to modify and / or develop new coordination processes.

The criticality of the role affects the relationship between controllability and the flux coordination created by member change. When teams have highly controllable attributions for member change, then role criticality does not impact the resulting flux in coordination nearly as much as when team attributions are that of uncontrollability. Controllable attributions for team member change assist in attenuating the flux in coordination that likely result from changes to highly critical roles. The ability to control when a critical team member leaves will give the team the ability to either implement safety measures (i.e., which potentially minimizes flux) or dictate the timing of the member change so that the change to the critical role comes at an opportune time (e.g., any business slowdown).

Under attributions of uncontrollability, the criticality of the member being changed impacts the flux in coordination much more than when teams make controllable attributions. When teams do not perceive control over their environment, the flux in coordination increases as the criticality of the member leaving increases. Because the team member encounters more of the problems that need to be overcome in the team, has a greater exposure to the tasks that the team is performing, and / or is more central to the workflow of the team (Humphrey et al., 2009), the ability to control these changes impacts the team's ability to develop new patterns of interaction and routines. Thus:

> *Hypothesis 4: The relationship between controllability and the flux in coordination caused by member change will be moderated by role criticality such that when team member attributions for member change are uncontrollable, role criticality increases the level of flux in coordination, whereas flux is not impacted by role criticality when the attribution is controllable.*

The criticality of the role that is being changed also differentially impacts the relationship between predictability and the flux in coordination created by member change. The more important the role, the more important is becomes for the team to be able to predict when those changes occur. This is due to the fact that individuals who hold more critical roles encounter more of the problems that need to be overcome in the team, have a greater exposure to the tasks that the team is performing, and / or are more central to the workflow of the team (Humphrey et al., 2009). Thus, under unpredictable attributions, the higher the role criticality of the individual involved in the member change, the higher the flux in coordination.

For these reasons, the predictability of these critical members becomes paramount in order for the team to mitigate the flux in coordination. When attributions for member change are

not predictable, role criticality exacerbates the flux in coordination as the team could not anticipate the impact of the member change. Changing a critical team member suddenly leaves the team's coordination in a state of disarray, as its established patterns of interaction are unexpectedly disrupted. Coordination is the management of synchronous and / or simultaneous activities, and involves information exchange and mutual adjustment of action (Brannick et al., 1993) in order to align the pace and sequencing of team member contributions with goal accomplishment. Consequently, when a team experiences membership change to highly critical roles, the predictability becomes imperative, so the team is able prepare and take the necessary actions for the impending flux in its coordination. Thus, the following relationship is hypothesized:

> *Hypothesis 5: The relationship between predictability and the flux in coordination caused by member change will be moderated by role criticality such that when team member attributions for member change are unpredictable, role criticality increases the level of flux in coordination, whereas flux is not impacted by role criticality when the attribution is predictable.*

Effectiveness

Coordination. Two theoretical frameworks, small groups as complex systems (GCS, Arrow et al., 2000) and entrainment theory (Ancona & Chong, 1996), are particularly helpful for articulating why coordination is impacted and how it, in turn, impacts team effectiveness. Both theories specify that coordination is the most critical process for transforming team inputs into team outputs. GCS focuses on relationships among people, tools, and tasks, activated by a combination of individual and collective purposes and goals that change and evolve as the group interacts over time (Arrow et al., 2000). Entrainment theory (Ancona & Chong, 1996) offers a complementary approach to explain coordination, as it contemplates the effects of time, rather than activity.

A team's ability to successfully coordinate roles and activities is paramount for team effectiveness (Reagans, Argote, & Brooks, 2005). For example, because a high level of coordination among team members is a significant indicator of effective production (e.g. software development teams, Ancona & Caldwell, 1992a; Kraut & Streeter, 1995; Pinto, Pinto, & Prescott, 1993), breakdowns in coordination are seen as a major obstacle inhibiting teams from realizing their objectives (Curtis, Krasner, & Iscoe, 1988). Thus, when teams experience flux in their coordination, this disrupts their ability to effectively work together, which,

consequently, effects performance.

Typically, coordination exists to the extent to which the work activities of team members are logically consistent and coherent (Cheng, 1983), and thus a well-coordinated team has work activities that are complementary and directed toward a collective goal without duplication or fragmentation of effort (Cheng, 1984). Flux in coordination, however, impacts a team's ability to accomplish well-coordinated activities due to duplication of efforts as well as not organizing interdependent activities in a logically consistent manner.

GCS (Arrow et al., 2000) suggests that different kinds of change have different meanings to team members and various implications for team coordination; thus, a team's reaction to change is due, at least partially, to the makeup of the coordination system. This is affected by how long a team has been in existence and under what circumstances. Routines and strategies that have been consistently successful will be quite tenacious, whereas team members will be less attached to behavior patterns that are associated with a mixed record. That said, the resulting flux teams experience in coordination as a result of member change, will mediate the relationship between how the team perceives that change (i.e., controllable and predictable) and a team's ability to perform its tasks. Thus:

> *Hypothesis 6: Flux in coordination will mediate the relationship between attributions for member change and change task performance following member change.*

CHAPTER 4
RESEARCH METHODOLOGY

This chapter describes the methodology used to test the hypotheses developed in Chapter 3. This chapter is organized into the following sections: (1) research participants (2) simulation, (3) measures, (4) procedures, (5) manipulations, and (6) overview of statistical analyses.

Participants

Research participants were 432 upper-level undergraduate students enrolled in management classes, each of whom were assigned to four-person teams. These 432 participants yielded 108 teams. All individuals were randomly assigned to teams, and all teams were randomly assigned to experimental conditions. In return for their participation, each individual earned class credit as well as being eligible for performance-based and randomly awarded prizes.

Participants were selected from two large Principles of Management sections that have 140 students enrolled in each class, one section of Organizational Behavior that has 140 students enrolled, one section of Contemporary Leadership with 38 students (pilot study), and one section of Negotiation that has 67 students enrolled. Students were required to participate in the lab experiment as part of course credit. The participation of each student was recorded across the experiment so as to decrease the impact of the experiment on the instructor's time.

Furthermore, the structure of the participating sections allowed me to utilize students as participants only once, since they are only enrolled in one of the sections. That is, the Principles of Management sections are for non-business, and those students are not enrolled in any of the other business classes. The Organizational Behavior section is a prerequisite for the two upper-level management electives, so there is not any overlap among those sections. As for the two upper-level management elective classes (Contemporary Leadership and Negotiation), only one current student overlapped.

Simulation

Overview

Randomly assigned teams participated in a computer simulation called SouperHot, which is designed to illustrate basic marketing concepts in a dynamic and participative way. Participants make a series of marketing decisions, the results of which are simulated using a

computer model that explores the major topics of: the product life cycle, pricing, promotion, and implications of profit and cash flow.

The simulation also gives participants the opportunity to practice their planning, decision-making, and team working skills. When approaching the simulation the participants should: (1) analyze the facts, (2) discuss the implications, (3) define objectives, and (4) prepare a plan and set goals. Because the overview of the simulation is deliberately short, it means that the initial analysis must be limited. This means that initially participants will be working with incomplete information. This is realistic, and teams should realize that they only will build up a full picture of the market and its problems and opportunities as the simulation progresses.

Although the overview is short, it includes sufficient information for the team to set broad objectives, make a plan of action, and make the initial decisions. However, it is likely that these objectives and goals will need to be refined as the simulation progresses. If the objectives are too vague, the team may degenerate into “fire fighting.” However, the chance of this is lessened if the team develops and uses measures that link their results with their objectives. In turn, this necessitates considering how the market is likely to respond.

SouperHot Simulation

The simulation divides into three distinct stages: (1) initial market penetration, (2) response to competition, and (3) phased withdrawal from the market. Despite the initial limited information, there are some key facts of which participants should be aware: (1) consumers are unaware of the product, (2) there is no competition but it will arrive, (3) there are "test market" results, and (4) there is limited finance.

The lack of awareness, coupled with the need to establish a position in the market before the competition arrives, means that there is a need for relatively heavy promotion. This “investment” in promotion needs to be funded until its impact is fully felt. In turn, this means that there is a need to charge a relatively high price to pay for the promotion. This high price also is consistent with the lack of competition, and the likely lack of consumer price sensitivity.

The “test market” provides a useful starting point for the initial decisions. The price of 1.90 represents a gross margin of 280%, and the 75,000 promotion allows 5% of the market to be penetrated in the first period. Based on these figures, it may be reasonable to increase the promotion expenditure and leave the price as it is. If the price is increased (substantially), this may increase short-term profits, but this is risky in both the short and the long term. The short-

term risk is associated with forecasting the effect. In fact, despite the lack of competition, if the price is increased to above 3.50, there is a marked increase in price sensitivity and hence drop in sales (i.e., the computer will warn the participants of the "extremeness" of this price). In the longer term, a significant increase in price will constrain the degree of market penetration before the arrival of the competition.

Equally, a reduction in price is likely to be unattractive. This is because as the consumers are unaware of the product, they will not know of the low price and hence not buy the product. Also, the newness of the product and the lack of competition suggests that little benefit will be gained from price-cutting. Finally, by cutting the price, profits will not be available to pay for the promotion needed to build awareness. This will restrict awareness and therefore market penetration both in the short and long term.

Before competition enters the market, the sales should increase rapidly as more consumers are persuaded to try the product and become loyal customers. This pattern of increase is typical of the introduction and growth stages of the product life cycle. For example, during the first period on average, say, five percent of customers buy the product. By the end of the period approximately double the number will be aware of the product; and, therefore, they will buy the product the following period. This "lagging" of demand may cause teams to under-forecast demand, and therefore, sales may be lost due to stock shortages.

As the sales increase, there will need to be a corresponding increase in productive capacity that will necessitate large expenditures of cash. Unfortunately, if a team "plays it safe," and maintains a sizable cash buffer, it will do so at the expense of market penetration. In turn, this will mean that the business will not be fully established before the competition arrives. Therefore, for long-term success, initially, teams must balance the need for market penetration against cash flow with the greater use of the available funds generally leading to better overall results.

The second stage of the simulation is response to competition. The following assumptions were made about the market when the competition enters it: (1) increased price sensitivity, (2) competitors have improved product, (3) competitors have improved message, and (4) competitors compete on price.

The normal response from most consumers when their product choice widens is to become more sensitive to price. Further, the competitors in researching and developing their

products will have been able to both improve the product and their sales messages. Therefore, it is reasonable to assume that the new competitive products will be better, as will the competitors' marketing messages. Finally, the competitors have recognized the likelihood of increased price sensitivity, and have entered the market at 1.50.

As time passes, and further competitors enter the market, the average market price will drift down, and the consumers will become even more price sensitive. However, the benefit of increased competition is increased awareness and, provided the price is competitive, sales will grow. As competitors enter the market, it will be necessary to change strategy to reduce price, maintain or reduce promotion, and consolidate production. To maintain profits, the price reduction has to be coupled with either holding or reducing the level of promotion. Equally, once competition is established, it will not be possible to grow the level of sales, and therefore, productive capacity should not be increased, or only increased with care.

If the initial policy of high price and promotion is maintained, it is the competitors who will benefit. The high level of promotion will make consumers aware of the product, but at the point of purchase, they will be attracted by the competitors' price. The actual timing of the entry of the competition will depend on how attractive the market seems to them. Thus, for a profitable team, the competition will enter in period 4. In contrast, for a loss-making team, the entry of the competition may be delayed until period 6.

The last phase of the simulation is phased withdrawal. Despite the reductions in price, the product will progressively become less and less competitive. Therefore, it will become necessary to withdraw from this market in the most profitable way. This is likely to become urgent following period 8. Withdrawal should be accomplished by a steady and phased reduction in price and promotion. The price reduction will maintain competitiveness, and it will take time for "loyal" customers to switch. Thus, withdrawal involves "milking" the relationship with customers.

Measures

This section discusses the measurement used for (1) the independent, moderator, and mediator variables, (2) outcome variables, (3) measures of important control variables. Measures and items can be found in Appendix A (pages 84-85).

Attributions

Team member attributions were measured and aggregated at the team level. Controllability was measured using items from the Revised Causal Dimension Scale (CDSII, McAuley, Duncan, & Russell, 1992), pertaining to member changes experienced by the team. Predictability of member change was measured using a 3-item measure assessing the extent to which team members believe that the member change was predictable. Cronbach's alphas were computed to measure the internal reliability of each measure.

Coordination

Coordination was measured using a scale adapted from an established coordination scale (Lewis, 2003), which taps into team members' perception of the flux in coordination caused by member change. This measure utilizes the same wording assessing team members' perceptions of coordination used by Lewis (2003), with the exception of tapping into the perceptions of disruption in those coordination items. Cronbach's alphas were computed to measure the internal reliability of the measure.

Role Criticality

A measure for role criticality was developed for this dissertation based on Humphrey et al.'s (2009) conceptualization of the construct. In addition, Cronbach's alphas were computed to measure the internal reliability of the measure.

Hinkin's (1998) steps were followed for measure development in surveys. First, items were generated using Humphrey et al.'s (2009) definition and description of the strategic core to theoretically ground the items, and to tap the entire construct domain. Following Hinkin (1998), the short and simple items were retained, avoiding complex language and double-barreled questions. Then, the questionnaire was administered to the sample and an exploratory factor analysis was conducted to assess the measure for unidimensionality.

Outcomes

The team effectiveness metric of cumulative profit was objectively measured and produced by the computer simulation. Additionally, a subjective measure of task performance was developed, in which Cronbach's alphas were computed to measure the internal reliability of the measure. Once again, Hinkin's (1998) recommendations for scale development were followed, concerning the need to keep the items short and simple, and avoiding complex language and double-barreled questions.

Control Variables

Because the simulation is more marketing based, participants' major and marketing experience was statistically controlled, and they were aggregated by summing marketing experience in months and major, which was dummy coded (1= marketing major, 0 = other).

Procedures

The investigator visited each classroom at the beginning of the Fall 2008 semester to introduce himself to the class as well as the teams' lab. Participants were introduced to the SouperHot simulation through a PowerPoint presentation that is included in Appendix A. Following the presentation, it was emphasized that teams would be competing against one another, so sharing information about the simulation or about their manipulations (e.g., they know member change is coming)was strictly forbidden, as well as being detrimental to their own performance and standing against other teams. Then, consent forms were distributed at that point to the participants. Teams were randomly assigned, and the randomly assigned teams were then randomly assigned to experimental conditions.

When participants entered the teams' lab, they found their team, names and corresponding role (a description of each role is described under the manipulation heading) under a team name (e.g., FAPMAA→ which translates to fall semester, principles of management class, team AA), along with the computer number that their team was assigned (i.e., computers were numbered 1-16). The simulation only allows for letters in the team name, which necessitated the use letter combinations for team names and not numbers. Participants joined with their team members at their designated computer, where each team was given a 1.44 MB, 3.5" floppy disk with their team name on it, so their performance and decision-making data were saved. Saving team data to floppy disks was necessary because the computers in the teams' lab have their memory cleared each time the computers are shut down. Teams were then instructed to save data to the default setting (i.e., My Documents) until the end of the simulation for that day, and then Copy and Paste the data to the A drive where the floppy disk is located. Additionally, by clearing the memory, other teams did not have access to existing data from other teams running the simulation. Next, teams were provided instruction regarding accessing and starting the simulation, where they then made decisions regarding the price, promotion, and production strategies based on the differentiated role assignments.

Teams progressed through eight periods of the simulation over the course of approximately an hour (this is Time 1). When they are finished, they returned their floppy disk to the investigator. They then filled out a survey. A listing of team names and their performance were then posted, so teams would be aware of their standing relative to other teams.

Teams then met three more times. The second run of the simulation was handled in the same manner as the first run, with the exception that team members already were acclimated to one another. The teams progressed through another eight periods of the simulation over the course of approximately one hour (this is Time 2). They filled out a survey when they finished. A listing of team names and their performance were posted once again, so teams were aware of their standing in relation to other teams.

After Time 2 is when the manipulations of controllability and predictability were administered. For teams receiving the controllability manipulation, departing members were allowed to share relevant information regarding the knowledge and responsibilities for their particular role within the team. For uncontrollable manipulations, no information was allowed to be passed. For the predictability manipulation, they were informed that a member from their team would be leaving, and would be replaced with another member. For those teams in the unpredictable manipulation, nothing was said to tip off the team off that member change would be coming.

The third run of the simulation transpired with teams having experienced membership change. The teams progressed through another eight periods of the simulation over the course of approximately one hour (this is Time 3). They then filled out a survey that measured (1) the controllability of the member change, (2) the predictability of the member change, (3) the criticality of the role that was changed, (4) the level of flux or disruption experienced in coordination, and (5) subject performance. A listing of team names and their performance levels were posted once again, so teams were aware of their standing relative to other teams.

Time 4 was the last run of the simulation, and teams progressed through another eight periods of the simulation over the course of approximately one hour. Then, they completed one last survey that measured the level of flux or disruption experienced in coordination and subject performance. After all participants had completed all four runs of the simulation, all participants were debriefed the purposes of the research. Also, the highest scorers (i.e., most accumulated profit) of each section were announced, as were the winners of the random drawing.

Manipulations

Team membership change was manipulated along the two attribution factors of controllability and predictability. The new team member came from another team. Controllability was manipulated by allowing some teams to have the member leaving the team pass along information (i.e., notes and any verbal communication deemed necessary) that they felt was important to the new member; uncontrollable situations were those where the team did not have volition regarding passing along of information to the new member. Predictability was manipulated by indicating to the team that a membership change would occur (i.e., without telling them who specifically), whereas unpredictable membership change was not indicated to the team.

Additionally, each four-member team was composed of one Vice-President of Production, one Vice-President of Promotion, and two Vice-Presidents of Finance. The VP of Production was responsible for setting the number of units produced, price, and inventory levels. The VP of Promotion was responsible for advertising duties regarding the launching and maintaining of SouperHot awareness. Last, the VPs of Finance oversaw the cash flow, sales income, and net profit, as well as helping manage assets. An overview of the roles can be seen in the Appendix section of this dissertation.

Manipulation checks were imposed to assess the adequacy of each manipulation. Manipulation check items were collected for all three manipulations: controllability, predictability, and role criticality. The validity of the manipulations was tested using analyses of variance (ANOVAs) in the context of the complete 2 x 2 x 2 mixed model experimental design. The logic is that each manipulation should yield significant effects on its corresponding manipulation check, and on no others. In this sense, the construct validity of each manipulation was scrutinized more thoroughly, both in terms of convergent validity (i.e., influencing what it was intended to) and discriminant validity (i.e., not influencing what it was not supposed to; Cook & Campbell, 1979).

Overview of Statistical Analyses

This section briefly describes the statistical methodology used in this dissertation. Hierarchical regression analysis was used to analyze the data for the flux in processes, as well as for the effects of moderator variables. As for the mediation analysis, the procedure outlined by Baron and Kenny (1986) was utilized.

Aggregation of Variables

When defining an attribute of a team (e.g., processes), researchers must demonstrate that the phenomenon being assessed is in fact a team-level construct (Klein, Dansereau, & Hall, 1994; Roberts, Hulin, & Rousseau, 1978; Rousseau, 1985). Bar-Tal (1990) outlined four such requirements that include: (1) the construct must reflect the team as a whole, rather than individuals as separate units; (2) agreement among members of a team with regard to the construct must be demonstrated; (3) the construct must discriminate among teams, and (4) the origin of the construct must reflect the process of interaction that occur within a team.

However, over the years, researchers analyzing team-level data have relied predominantly upon collecting data on team processes from individual team members, and then aggregating responses to the team level (e.g., Alper et al., 2000; Barrick et al., 1998; Campion et al., 1993; Guzzo et al., 1993; Stewart & Barrick, 2000). In order to justify the use of aggregating individual-level scores, researchers need to empirically demonstrate that the aggregated data reflect the team-level attributes. In addition, the theory and hypotheses investigated focus on team-level constructs and variables, so there us relevant concern with analyzing team-level data, and how team-level variables impact other team-level variables.

One piece of evidence that supports a case for aggregation is demonstrating that team members agree with each other in their assessments of team attributes, through a measure of within-team agreement. Within-team agreement was measured via the James, Demaree, and Wolf (1984; 1993) index of interrater agreement ($r_{wg(i)}$), which assesses the homogeneity of team member perceptions on a multi-item scale. In addition, the intra-class correlation coefficient (ICC(1)) was utilized to assess inter-rater reliability (James et al., 1984).

The primary variables that were aggregated from the individual to the team level are predictability, controllability, role criticality, flux in coordination, and subjective performance. After the variables were aggregated, the $r_{wg(i)}$ and ICC(1) values were calculated to determine interrater agreement and reliability. Moreover, the control variable of marketing experience was aggregated using a summation of the total marketing experience of the team (in months), whereas the control variable of major was dummy coded, then summed.

Hierarchical Regression

For the purposes of this dissertation, a hierarchical regression analysis and moderated hierarchical regression analysis were utilized, following the recommendations of Cohen and

Cohen (1983). In step one, the effects of the covariates of marketing experience and major on flux in coordination were examined. In steps two through four, the main effects of controllability, predictability, and role criticality were examined. Then the interaction term of controllability x predictability on the flux in coordination was examined. In the last steps, the interactive effects of controllability x role criticality and predictability x role criticality on flux in coordination were examined.

Mediation

To test for mediation, estimation of the three following regression equations was necessary: (1) regressing the mediator on the independent variable; (2) regressing the dependent variable on the independent variable; and (3) regressing the dependent variable on both the independent variable and on the mediator. Separate coefficients for each equation need to be estimated and tested. There is no need for hierarchical or stepwise regression, or the computation of any partial or semi-partial correlations (Baron & Kenny, 1986). For the purposes of this dissertation, partial mediation was expected.

These three regression equations provide the tests of the linkages of the mediation model. To establish mediation, the following conditions must hold: (1) the independent variable must affect the mediator in the first equation; (2) the independent variable must be shown to affect the dependent variable in the second equation; and (3) the mediator must affect the dependent variable in the third equation. If these conditions all hold in the predicted direction, then the effect of the independent variable on the dependent variable must be less in the third equation than in the second. Perfect mediation holds if the independent variable has no effect when the mediator is controlled (Baron & Kenny, 1986).

The first condition was tested by regressing the flux in coordination on controllability and predictability. The first condition would be supported if controllability and predictability were significantly related to the flux in coordination. To test for the second condition, task performance was regressed on flux in coordination. It should be noted that the objective measures of performance were collected at the end of each run. To address this matter, prior task performance was controlled when analyzing the data. This condition would be met if the mediator (i.e., flux in coordination) is related to task performance.

Moreover, Sobel (1982) provided an approximate significance test for the indirect effect of the independent variable on the dependent variable via the mediator. Thus, the significance of

the indirect effects of member change and performance as mediated by flux in coordination were estimated and tested (Baron & Kenny, 1986; Cohen & Cohen, 1983). The indirect effect is equal to the drop in the direct effect when the mediator is included in the equation. Therefore, the significance test for the indirect effect provides significance for the third condition of mediation (MacKinnon, Warsi, & Dwyer, 1995).

Using the matrix formulae derived by Sobel (1982), the product of coefficients strategy was applied to obtain point estimates and first-order standard errors for the indirect effect "path" in an equation simultaneously modeling the paths created by the direct effect of *X* (predictor) on *Y* (outcome), as well as the indirect effect of *X* on *Y* through *M* (mediator). These standard errors permit significance testing using critical ratios for measuring specific indirect effects (i.e., the path coefficient of each individual mediation path). Specifically, the indirect effects of controllability and predictability and on task performance was examined via the flux in coordination.

This approach uses the critical ratio to test for significance, as follows, $s_{ab} = \sqrt{b^2 s_a^2 + a^2 s_b^2 + s_a^2 s_b^2}$. Standard errors of *a* and *b* are represented, respectively, by s_a and s_b. The standard error of the indirect effect (s_{ab}) is given by Aroian (1944), Mood, Graybill, and Boes (1974), and Sobel (1982). In order to conduct the test, *ab* is divided by s_{ab} to yield a critical ratio that is traditionally compared with the critical value from the standard normal distribution appropriate for a given alpha level. *a* is the coefficient corresponding to the effect of the independent variable on the mediator; *b* is the coefficient corresponding to the effect of the mediator on the dependent variable, partialling out the effect of the independent variable; *ab*, the product of the *a* and *b* paths, represents the indirect effect of the independent variable on the dependent variable through the mediator; and s_a and s_b are the variances of the coefficients for paths *a* and *b*, respectively (Preacher & Hayes, 2004).

Summary

This chapter outlined the sample, measures, and hypothesis tests used in this study. This study used a longitudinal research design to test the hypotheses developed in Chapter 3. Measures for each construct in the study were identified, and their data sources were described. Finally, variable aggregation, hierarchical moderated regression, and mediation analysis were presented, by which the hypotheses were tested.

Pilot Study

To ensure that the simulation, manipulations, and measures would operate as expected, preliminary data (i.e., 5 teams) were collected during the Summer 2008 session. These data were useful in better calibrating a few minor operational procedures, as well as providing a better understanding of control in laboratory settings.

Participants

Twenty-five undergraduate students enrolled in an upper-level management class participated in the study. Students received class credit as the simulation was designed to be a component of the class.

Manipulations and Measures

Manipulation checks were conducted to determine whether the independent variables utilized were in fact manipulated as intended. The attributional dimensions of controllability and predictability, as well as role criticality, were successfully operationalized in the simulation. In order to test for statistically significance differences in group means on the specific dimensions, one-way ANOVAs were used. Participants receiving the manipulations did, in fact, differ on (1) predictability ($F = 13.36$, $p < .05$), (2) controllability ($F = 207.79$, $p < .001$), and (3) role criticality ($F = 32.01$, $p < .01$).

The measures that were of primary concern were the role criticality measure and the measure of subjective performance as they were developed for this dissertation. Role criticality was measured with five items, and demonstrated a Cronbach's alpha .95, whereas subjective performance was measured with three items and had a Cronbach's alpha of .85. In addition, the attributions of controllability exhibited a Cronbach's alpha of .94, and the attributions of predictability scale had a Cronbach's alpha of .79. All are above the .70 value that typically is recommended (Nunnally, 1978).

CHAPTER 5
RESULTS

The following sections first review the results concerning the measurement and aggregation of the variables, including the reliabilities, r_{wg}, and ICC(1). Next, the descriptive statistics and intercorrelations of the variables of interest are discussed. Then, the manipulation checks are provided to ensure that the manipulations implemented during the simulation were operationalized, as intended, and demonstrated the desired effects. Finally, the results of the hierarchical regression and mediation analyses, testing the proposed relationships, are discussed.

Item Analysis

Before individual-level variables can be aggregated to the team level, steps have to be taken to ensure that aggregation is a plausible step (Bar-Tal, 1990; James et al., 1984; 1993). First, Table 5.1 overviews the variables of interest, the number of items per variable, and the reliabilities. All variables measured demonstrate high levels of internal consistency reliability, and are above the .70 value typically recommended (Nunnally, 1978).

Table 5.1
Reliabilities and Item Information

Variable	Number of Items	Cronbach's Alpha
Controllability	6	.92
Predictability	3	.97
Role Criticality	5	.97
Flux in Coordination	4	.96
Subjective Task Performance	3	.87

One piece of evidence that supports a case for aggregation is demonstrating that team members agree with each other in their assessments of team attributes, through a measure of within-team agreement. Within-team agreement was measured via the James et al. (1984; 1993) index of interrater agreement ($r_{wg(i)}$), which assesses the homogeneity of team member perceptions on a multi-item scale. As seen in Table 5.2 below, the within-group agreement indices on all variables exceed the .70 level that James et al. (1984) recommended as necessary to justify the aggregation of individual-level data to group-level measures. In addition, the ICC(1) index is utilized as well to assess inter-rater reliability (James et al., 1984), which

determines that less variation exists within teams than between teams. Team members agreed with one another about the scores they provided on all aggregated variables, as all ICC(1) values were significant.

Table 5.2
ICC(1) and rwg of Aggregated Variables

Variable	*F*	*p* <	ICC	r_{wg}
FluxCoordT1	11.95	.01	.92	.86
Role Criticality	19.14	.01	.89	.95
Controllability	13.53	.01	.93	.91
Predictability	22.19	.01	.91	.92
Subjective Task Performance	2.86	.01	.65	.99

n = 108

Power Analysis

This section briefly describes Cohen's (1985) analysis of power (i.e., the conditional probability of rejection of the null hypothesis in a study, given that treatments, interventions, etc. do, in fact, exhibit some effect on the population) for the current study. Power analyses deal with the relationships between the structure of hypothesis tests, the nature of the phenomena being studied, and the likelihood that the tests consistently will detect the effects of treatments, interventions, and the like (Murphy, 2002). The determinants of statistical power are established by the relationship between (1) sensitivity—the precision with which a statistical test distinguishes between true treatment effects and differences in scores that are the result of sampling error, which is generally affected by sample size; (2) decision criteria—usually a tradeoff between Type I and Type II errors (i.e., alpha); and (3) effect size—the key concept in power analysis and described as the standardized index of the magnitude of impact that the treatments actually exert on the dependent variables. In experiments, the treatments typically exhibit strong effects, which help ensure reliability and construct validity (Murphy, 2002).

Power analyses can be particularly beneficial when used as a diagnostic tool in the evaluation of a study (Murphy, 2002). For the current study, the sample size was 108, the alpha was set to .05, and the effect size attributable to the addition of the second set of predictors

beyond the control variables was .56, with three predictors as control variables and six additional predictors. Thus, according to Cohen (1985), the statistical power for this study is .995, which is well above the suggested .80.

Descriptive Statistics and Intercorrelations

Table 5.3 reports the means, standard deviation, and intercorrelations of all variables in the study. Task Performance at Time 2 and Time 3 were standardized. The average marketing experience of a team was 8.22 months.

As seen in Table 5.3, Time 2 task performance was significantly correlated with predictability ($r = -.19$, $p = .045$), role criticality ($r < .32$, $p = .001$), flux in coordination ($r = .34$, $p < .001$), and time 3 task performance ($r = .55$, $p < .001$) but not significantly correlated with controllability ($r = -.06$, $p = .550$) or subjective performance ($r = .11$, $p = .26$). Time 3 task performance was significantly correlated with team marketing experience ($r = .30$, $p = .01$), controllability ($r = .33$, $p < .001$), predictability ($r = .21$, $p = .026$), flux in coordination ($r = -.27$, $p = .005$), and subjective performance ($r = .37$, $p < .001$). Time 3 task performance was not significantly correlated with major ($r = .02$, $p = .831$) or role criticality ($r = -.08$, $p = .424$). Other significant correlations of interest are subjective performance and flux in coordination ($r = -.38$, $p = .001$) as well as flux in coordination with controllability ($r = -.35$ $p < .001$), predictability ($r = -.39$, $p < .001$), and role criticality ($r = .68$, $p < .001$).

Table 5.3
Means, Standard Deviation, and Intercorrelations among Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Task Performance Time 2	0	1.00		.						
2. Marketing Experience	8.22	12.79	.18							
3. Major	. 57	.81	-.04	.03						
4. Controllability	.44	.50	-.06	.01	.02					
5. Predictability	.39	.49	-.19*	.18	.10	.51**				
6. Role Criticality	.48	.50	.32**	-.03	.04	.07	-.20*			
7. Flux in Coordination	2.30	1.19	.34**	-.05	-.06	-.35**	-.39**	.68**		
8. Subjective Task Performance	3.95	.54	.11	.20	.04	.14	.16	-.18	-.38**	
9. Task Performance Time 3	0	1.00	.55**	.26*	.02	.33**	.21*	-.08	-.27**	.37**

$n = 108$ * $p < .05$ ** $p < .01$

Manipulation Checks

Manipulation checks also were conducted to determine whether the independent variables utilized were in fact manipulated. The attributional dimensions of controllability and predictability, as well as role criticality were successfully operationalized in the simulation. In order to test for statistically significance differences in group means on the specific dimensions, between-subjects ANOVAs were conducted to identify any joint or interactive effects. Tables 5.4, 5.5, and 5.6 report the between-subjects ANOVAs for each of the three manipulations. Participants receiving the manipulations did, in fact, differ on all of the manipulations. For the controllability manipulation, attributions for controllability ($F = 67.69$, $p < .01$) were significant, and accounted for over 40% of the variance in the manipulation ($\eta^2 = .402$), and 74% of the proportional variance in the manipulation (i.e., the eta-squared values reflect the proportion of

variance accounted for by a particular effect). It should be noted that role criticality as a main effect also was significant ($F = 5.73$, $p = .019$). However, role criticality only accounted for a little over 5% of the variance ($\eta^2 = .054$), and did not exhibit near the magnitude of effect as did the attribution for controllability. Second, for the predictability manipulation, attributions for predictability as a main effect ($F = 181.67$, $p < .01$) were significant and accounted for over 64% of the variance in the manipulation for predictability ($\eta^2 = .64$), and 84% of the proportional variance in the manipulation. Similar to the manipulation check for controllability, the manipulation for predictability also had another variable that was significant. Attributions for controllability were significant ($F = 7.36$, $p = .008$). However, the variance accounted for by attributions of controllability on the manipulation of predictability was only 6.8%. The last manipulation check performed was for role criticality, where team members significantly accounted for differences in the importance of the team member changing ($F = 347.94$ $p < .01$) while accounting for 77.5% of the variance in the role criticality manipulation ($\eta^2 = .775$), and 95% of the proportional variance in the manipulation. Moreover, no other attributions were significantly related to the role criticality manipulation. Also it should be noted that there were no significant interactions among the attributions of controllability and predictability, nor for role criticality.

Table 5.4
Manipulation Checks: Between Subject Factors Control Dependent Variable

Source	*F*	*p* =	Partial Eta Squared
Controllability (C)	67.69	.000**	.40
Predictability (P)	2.14	.146	.02
Role Criticality (RC)	5.73	.019*	.05
C x P	2.84	.095	.03
C x RC	2.59	.111	.03
P x RC	1.09	.298	.01
C x P x RC			.00

* $p < .05$ ** $p < .01$

Table 5.5
Manipulation Checks: Between Subject Factors Predictability Dependent Variable

Source	*F*	*p* =	Partial Eta Squared
Controllability (C)	7.36	.008**	.07
Predictability (P)	181.76	.000**	.64
Role Criticality (RC)	.04	.850	.00
C x P	1.16	.284	.01
C x RC	.97	.328	.01
P x RC	2.71	.103	.03
C x P x RC			.00

* $p < .05$ ** $p < .01$

Table 5.6
Manipulation Checks: Between Subject Factors Role Criticality Dependent Variable

Source	*F*	*p* =	Partial Eta Squared
Controllability	2.53	.115	.02
Predictability	.00	.997	.00
Role Criticality	347.94	.000**	.78
C x P	.10	.756	.00
C x RC	.08	.780	.00
P x RC	1.60	.209	.02
C x P x RC			.00

* $p < .05$ ** $p < .01$

Hypothesis Testing

The following section tests the hypotheses proposed in Chapter 3. The first five hypotheses are analyzed utilizing hierarchical regression techniques. Hypothesis 6, then, is tested via mediation analysis.

Hierarchical Regression

Hierarchical regression analyses examined Hypotheses 1 and 2 to test the main effects of team member attributions on the flux experienced in coordination. Moderated regression analyses examined the Hypotheses 3-5. In the first step, marketing experience and major were included followed by controllability and predictability, and then role criticality as main effect terms in steps two, three, and four, respectively. Next, the interaction between manipulations was then entered in the subsequent steps of 5-7. In step 5, the controllability x predictability term was entered, followed by the controllability x role criticality interaction in step 6, and the predictability x role criticality term in the last step. Regression results indicate that the controls entered in step 1 were not significant, marketing experience (β = -.06, p = .558) and major (β = -

.04, p = .671). Consistent with Hypothesis 1 (i.e., more control would lead to lower levels of flux), the results indicate that controllability (β = -.34, p < .001) is a significant predictor of flux in coordination, thus lending support for this hypothesis. The change in R^2 was .11 indicating that controllability contributed an additional 11% of explained variance. Hypothesis 2 predicted that the more predictable membership change was, the lower the flux in coordination would be experienced by the team. The results indicate that predictability (β = -.28, p = .011) with a change in R^2 of .06 are significant, thus providing support for Hypothesis 2.

Hypotheses 3-5 predicted interactions among variables. Hypothesis 3 predicted the interactive effect for controllability and predictability on flux in coordination, which was entered in step 5. The regression results suggest that the interactive relationship proposed in hypothesis 3 was not supported (β = -.11, p = .417), with a change in R^2 of .00. Hypotheses 4 and 5 introduced the moderating influence of role criticality on controllability and predictability, respectively. More specifically, Hypothesis 4 predicted that role criticality would moderate the controllability-flux relationship, such that in uncontrollable situations, highly critical membership change would result in more flux in coordination. The interaction terms were entered in step 6, and the regression results indicated that the controllability x role criticality term (β = -.26, p = .019) was significant, with a change in R^2 of .021, thus supporting Hypothesis 4. Additionally, the interaction is plotted in Figure 5.1, demonstrating that when the role being changed was critical, controllability strongly reduced flux. However, when the role being changed was not critical, controllability did not impact flux nearly as much. Lastly, Hypothesis 5 predicted that role criticality would moderate the predictability-flux relationship, such that in unpredictable situations, highly critical membership change would result in more flux in coordination. The interaction terms were entered in step 7, and the regression results indicated that the predictability x role criticality term (β = -04, p = .749) was not significant (R^2 < .001), thus failing to support Hypothesis 5.

Table 5.7
Results of Hierarchical Moderated Regression Analysis—Flux in Coordination Dependent Variable

Step	Independent Variable	β	ΔR^2	ΔF
1	Marketing Experience	-.06	.01	.29
	Major	-.04		
2	Controllability	-.34**	.11	13.18**
3	Predictability	-.28*	.06	6.78*
4	Role Criticality	.70**	.45	119.44**
5	Controllability x Predictability	.11	.00	.66
6	Controllability x Role Criticality	-.26*	.02	5.73*
7	Predictability x Role Criticality	-.04	.00	.10
Full Model Statistics		Total R^2 = .65	$F(8, 98)$ = 22.22**	

* $p < .05$ ** $p < .01$

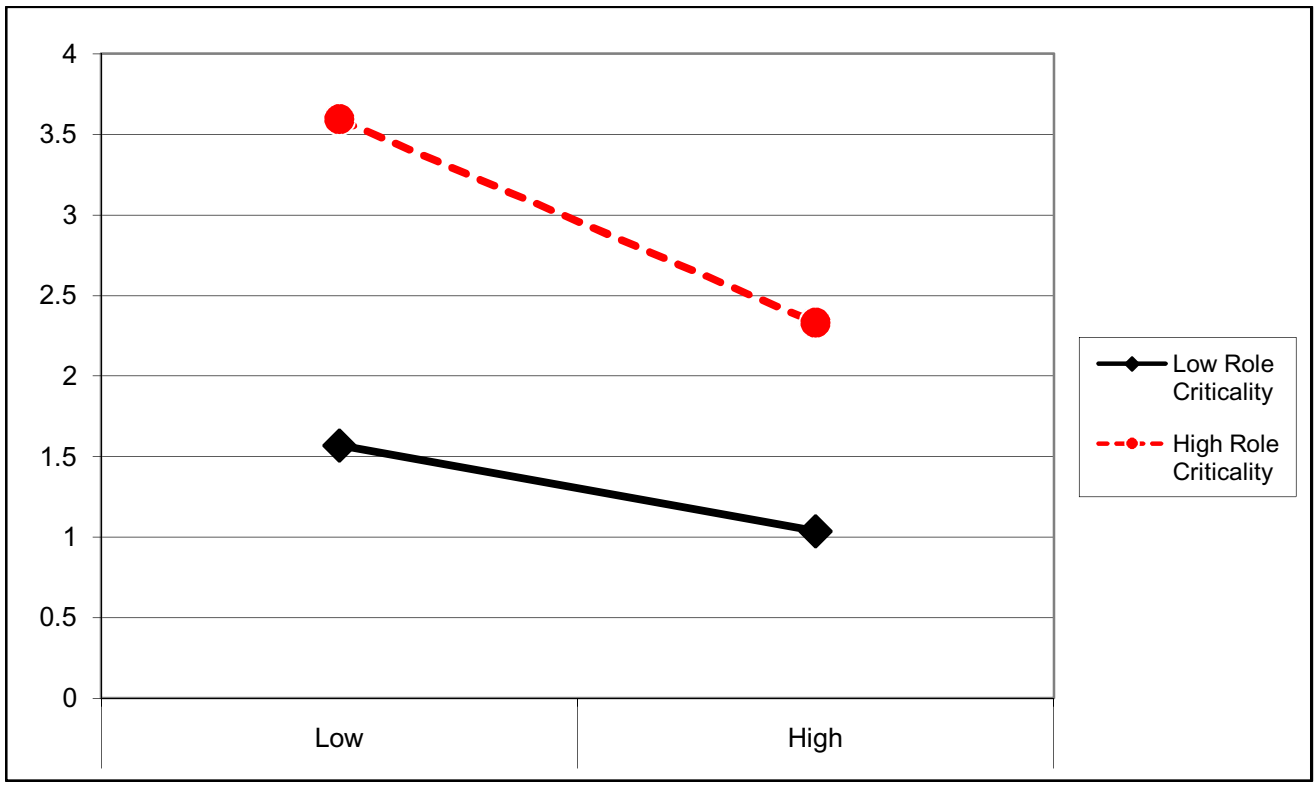


Figure 5.1 Interaction of Controllability and Role Criticality on Flux in Coordination

Mediation Analysis

This section describes the results for testing Hypothesis 6, which proposed that flux in coordination would mediate the controllability/predictability-task performance relationship. Four steps have been recommended for the assessment of mediation (Baron & Kenny, 1986; Judd & Kenny, 1981). Step 1 demonstrates that the initial variable is correlated with the outcome by using Y as the criterion variable in a regression equation and X as a predictor (estimate and test path c). This step establishes that there is an effect that may be mediated. Step 2 then shows that the initial variable is correlated with the mediator by applying M as the criterion variable in the regression equation, and X as a predictor (estimate and test path a). This step essentially involves treating the mediator as if it was an outcome variable. Next, step 3 expresses that the mediator affects the outcome variable, by using Y as the criterion variable in a regression equation, and X and M as predictors (estimate and test path b). It is not sufficient just to correlate the mediator with the outcome; the mediator and the outcome may be correlated because they are both caused by the initial variable X. Thus, the initial variable must be controlled in establishing the effect of the mediator on the outcome. Lastly, step 4 establishes that M completely mediates the X-Y relationship, so the effect of X on Y controlling for M (path c') should be zero. The effects in both Steps 3 and 4 are estimated in the same equation. Tables 5.8 and 5.9 report the steps and results. As can be seen from the tables below, flux is established as a mediator variable for controllability's and predictability's effect on task performance, as the betas for the both controllability-task performance relationship and the predictability-task performance relationship both decreased when flux was added as a control in step 4 (Baron & Kenny, 1986).

Table 5.8
Baron & Kenny Mediation Steps Controllability→Flux→Task Performance

Step	Variables	β
1	Controllability (X)→Task Performance (Y)	.35**
2	Controllability (X)→Flux in Coordination (M)	-.34**
3	Flux in Coordination (M)→Task Performance (Y)	-.23*
4	Controlling for Flux in Coordination, Controllability (X)→Task Performance (Y)	.27**

Note: $n = 108$. * $p < .05$ ** $p < .01$

Table 5.9
Baron & Kenny Mediation Steps Predictability→Flux→Task Performance

Step	Variables	β
1	Predictability (X)→Task Performance (Y)	.30**
2	Predictability (X)→Flux in Coordination (M)	-.38**
3	Flux in Coordination (M)→Task Performance (Y)	-.23*
4	Controlling for Flux in Coordination, Predictability (X)→Task Performance (Y)	.19

Note: $n = 108$. * $p < .05$ ** $p < .01$

In addition to Baron and Kenny's (1986) mediation steps, a Sobel (1982) test was conducted to provide an approximate significance test for the indirect effect of the independent variables (i.e., controllability and predictability) on the dependent variable (i.e., task performance), via the mediator (i.e., in coordination) (Baron & Kenny, 1986; Cohen & Cohen, 1983). The indirect effect is equal to the drop in the direct effect when the mediator is included in the equation. Therefore, the significance test for the indirect effect provides evidence for the third condition of mediation (MacKinnon et al., 1995). Accounting for the indirect effect, the results from the Sobel test indicate that flux mediates both the controllability-task performance and the predictability-task performance relationship.

Table 5.10
Sobel Tests for Mediation: Controllability and Predictability on Change in Task Performance through Flux in Coordination

Variable	a	b	S_a	S_b	Test Statistic
Controllability	-.74	-.34	.21	.06	3.02**
Predictability	-.75	-.36	.22	.06	2.93**

* $p < .05$ ** $p < .01$

Hypothesis 6 proposed that flux in coordination would mediate the controllability/predictability change-task performance relationship. Table 5.11 presents the direct, indirect, and total effects for the mediation decomposition as recommended by Preacher and Hayes (2004). Regarding the indirect effects for controllability ($\beta = .25$, $p < .05$) and predictability ($\beta = .27$, $p < .05$), both were significant, thus demonstrating partial mediation, and support Hypothesis 6. More specifically, flux in coordination mediates 36% of the relationship

between controllability and task performance, whereas flux mediates 45% of the relationship between predictability and task performance.

Table 5.11
Effects Decomposition for Mediation

Independent Variable	Direct effect (unmediated effect)	Indirect effect (mediation by flux in coordination)	Total effect	R^2	F
Controllability	.45**	.25*	.70**	.59	29.03**
Predictability	.34*	.27*	.61**	.57	26.75**

Note: n = 108. Controlled for time 2 task performance, marketing experience, and major.
* $p < .05$ ** $p < .01$

Additional Analyses

In addition to running the data analyses outlined in Chapter 4, the complexity of the proposed model prompted further statistical scrutiny. As such, additional analyses were conducted, including bootstrapping, analyzing main effects and interactions on time 3 task performance and subjective performance, running the hierarchical regression with the manipulation checks rather than the manipulations, analyzing role criticality as an independent variable while examining it in a mediation context, and including moderated mediation analysis, accounting for role criticality in the controllability/predictability-flux-task performance relationship, as suggested by Preacher, Rucker, and Hayes (2007).

Bootstrapping

According to Preacher and Hayes (2004), bootstrapping is an additional approach that moves beyond Baron and Kenny's (1986) mediation steps. Bootstrapping is a nonparametric approach to effect-size estimation and hypothesis testing that makes no assumptions about the shape of the distributions of the variables or the sampling distribution of the statistic (Preacher & Hayes, 1994). This approach has been suggested by others as a way of circumventing the power problem introduced by asymmetries and other forms of non-normality in the sampling distribution of *ab* (Bollen & Stine, 1990; Lockwood & MacKinnon, 1998). Also, bootstrapping produces a test that is not based on large-sample theory, meaning it can be applied to small

samples with more confidence. Bootstrapping is accomplished by taking a large number of samples of size *n* (i.e., where *n* is the original sample size) from the data, *sampling with replacement*, and computing the indirect effect, *ab*, in each sample (Preacher & Hayes, 2004). As seen in the output, the true indirect effect is estimated to lie between .16 and .50 with 95% confidence. Additionally, the bootstrapped estimate of the indirect effect of predictability is estimated to lie between .13 and .47 with 95% confidence. Because zero is not included in the 95% confidence interval, it can be concluded that the indirect effect is indeed significantly different from zero at $p < .05$ (two tailed), which also supports Hypothesis 6.

Table 5.12
Bootstrap Results for Indirect Effects of Flux in Coordination

Variable	Bias Corrected Confidence Intervals	
	Lower	**Upper**
Controllability	.16	.50
Predictability	.13	.47

Note: Confidence interval does not include zero, thus the indirect effect is indeed significantly different from zero at $p < .05$ (two tailed) for controllability and predictability.

Hierarchical Regression

Table 5.13 first reports the results of the independent and interactive effects of the substantial variables in the study on flux in coordination. One notable change is the use of three steps to report the results as opposed to the seven steps reported in table 5.7. Doing so slightly changes the interpretation of the results: (1) predictability is now non-significant ($\beta = -.05$, $p = .491$), and (2) the controllability x role criticality interaction is also non-significant ($\beta = -.23$, $p = .15$). Second, tables 5.14 and 5.15 report the results of the independent and interactive effects of the substantial variables in the study on time 3 task performance and subjective performance, respectively. The results indicate that the main effects of controllability ($\beta = .35$, $p < .001$ $\Delta R^2 = .12$) and role criticality ($\beta = -.29$, $p < .001$ $\Delta R^2 = .07$) on time 3 task performance both are significant. Consequently, enough evidence is present to consider role criticality as a main effect variable, and not just a moderator.

Table 5.14 analyzed subjective performance as the dependent variable. The results for the subjective measure were not nearly as robust as for the objective measure of performance. As can be seen in Table 5.14, only the controllability x role criticality term was significant ($\beta = -.41$,

$p = .018$ $\Delta R^2 = .05$), while the model only accounted for 14% of the variance (as opposed to 58% for the objective measure).

Table 5.13
Results of Hierarchical Moderated Regression Analysis—Flux in Coordination Dependent Variable

Step	Independent Variable	β	ΔR^2	ΔF
1	Marketing Experience	-.06	.00	.18
	Major	-.04		
2	Controllability	-.37**	.66**	58.76**
	Predictability	-.05		
	Role Criticality	.70**		
3	Controllability x Predictability	.04	.03	2.41
	Controllability x Role Criticality	-.23		
	Predictability x Role Criticality	-.04		
Full Model Statistics		Total $R^2 = .65$	$F(8,98) = 22.22$***	

* $p < .05$ ** $p < .01$

Table 5.14
Results of Hierarchical Moderated Regression Analysis—Task Performance Time 3 Dependent Variable

Step	Independent Variable	β	ΔR^2	ΔF
1	Cumulative Profit T2	.56**	.31	46.77**
2	Marketing Experience	.19*	.04	2.89
	Major	.02		
3	Controllability	.35**	.12	23.39**
4	Predictability	.15	.02	3.06
5	Role Criticality	-.29**	.07	15.30**
6	Controllability x Predictability	.27	.02	3.33
7	Controllability x Role Criticality	.10	.00	.68
8	Predictability x Role Criticality	-.21	.01	1.92
Full Model Statistics		Total $R^2 = .58$	$F(9, 97) = 14.72$**	

* $p < .05$ ** $p < .01$

Table 5.15
Results of Hierarchical Moderated Regression Analysis—Subjective Performance Time 3 Dependent Variable

Step	Independent Variable	β	ΔR^2	ΔF
1	Marketing Experience	.00	.04	.10
	Major	.21*		
2	Controllability	.11	.01	.24
3	Predictability	.07	.00	.54
4	Role Criticality	-.16	.02	.12
5	Controllability x Predictability	.04	.00	.86
6	Controllability x Role Criticality	.41*	.05	.02*
7	Predictability x Role Criticality	-.13	.00	.55
Full Model Statistics		Total $R^2 = .14$	$F(8, 98) = 1.19$	

* $p < .05$ ** $p < .01$

Tables 5.16 and 5.17 report the results of independent and interactive effects of the substantial variables in the study on flux in coordination and time 3 task performance, with the manipulation checks rather than the manipulations themselves. The results for flux as the dependent variable (Table 5.15) were similar to the results when the manipulations were used, with a couple of exceptions. First, the overall model did not account for as much variance (61% compared to 65%). Second, predictability is not significant in the current model ($\beta = .15$, $p = .19$, $\Delta R^2 = .02$). Otherwise, controllability ($\beta = .39$, $p < .001$, $\Delta R^2 = .15$), role criticality ($\beta = .68$, $p < .001$, $\Delta R^2 = .44$), and the controllability x role criticality interaction term ($\beta = .52$, $p = .02$, $\Delta R^2 = .02$) are all significant, similar to the model with the actual manipulations.

The results for Table 5.17 use time 3 task performance as the dependent variable. When compared to the model with the actual manipulations, this model is very similar. The overall model, once again, did not account for as much variance (i.e., 53% compared to 58%). However, the same variables are significant in both models. The control variables of time 2 cumulative profit ($\beta = .56$, $p < .001$, $\Delta R^2 = .31$) and marketing experience ($\beta = .193$, $p = .022$, $\Delta R^2 = .04$), as well as the main effects of controllability ($\beta = -.37$, $p < .001$, $\Delta R^2 = .13$ and role criticality ($\beta = -.20$, $p = .015$, $\Delta R^2 = .03$) are all significant, which parallels the original model.

Table 5.16
Results of Hierarchical Moderated Regression Analysis—Flux in Coordination DV

Step	Independent Variable	β	ΔR^2	ΔF
1	Marketing Experience	-.06	.01	.28
	Major	-.04		
2	Controllability	.39**	.15	18.27
3	Predictability	.15	.02	1.78
4	Role Criticality	.68**	.442	112.94
5	Controllability x Predictability	.05	.00	.03
6	Controllability x Role Criticality	.52*	.02	6.13
7	Predictability x Role Criticality	-.03	.00	.01
Full Model Statistics		Total $R^2 = .61$	$F(8, 98) = 21.06$**	

* $p < .05$ ** $p < .01$

Table 5.17
Results of Hierarchical Moderated Regression Analysis— Task Performance Time 3 DV

Step	Independent Variable	β	ΔR^2	ΔF
1	Cumulative Profit T2	.56**	.31	45.44
2	Marketing Experience	.19*	.04	2.79
	Major	.01		
3	Controllability	-.37**	.13	24.55
4	Predictability	-.13	.01	2.06
5	Role Criticality	-.20*	.03	6.10
6	Controllability x Predictability	.35	.01	1.18
7	Controllability x Role Criticality	-.13	.00	.28
8	Predictability x Role Criticality	.15	.00	.21
Full Model Statistics		Total $R^2 = .53$	$F(9, 97) = 11.52$**	

* $p < .05$ ** $p < .01$

Role Criticality

After examining role criticality's effect in the hierarchical regression analysis, there is sufficient evidence to pursue its role as a main effect. In doing so, role criticality's impact as an independent variable for mediation testing is reported. Table 5.18 outlines the Baron and Kenny (1986) steps for establishing mediation. The decrease in role criticality's beta coefficient ($\beta = -.27$, $p < .001$) in step 1, then falls to a non-significant level when controlling for flux ($\beta = -.19$, $p = .130$), thus establishing flux as a mediator in the role criticality-task performance relationship. These results are not supported by the Sobel (1982) test as reported in Table 5.19, as the Sobel test statistic is non-significant. However, due to the possible non-normality of role criticality's distribution, the bootstrap estimates outlined in Table 5.20 indicate that the true indirect effect is estimated to lie between -0.90 and -0.44 with 95% confidence, thus supporting flux as a mediator. Furthermore, Table 5.21 details the direct, indirect, and total effects for role criticality ($\beta = -0.67$, $p < .01$), thus supporting the notion that flux partially mediates the role criticality-task performance relationship.

Table 5.18
Baron & Kenny Mediation Steps Role Criticality→Flux→Task Performance

Step	Variables	β
1	Role Criticality (X)→Task Performance (Y)	-.27**
2	Role Criticality (X)→Flux in Coordination (M)	-.68**
3	Flux in Coordination (M)→Task Performance (Y)	-.23*
4	Controlling for Flux in Coordination, Role Criticality (X)→Task Performance (Y)	-.19

Note: $n = 108$. * $p < .05$ ** $p < .01$

Table 5.19
Sobel Tests for Mediation: Role Criticality on Task Performance through Flux

Variable	a	b	S_a	S_b	Test Statistic
Role Criticality	.44	-.18	.19	.09	-1.55

* $p < .05$ ** $p < .01$

Table 5.20
Bootstrap Results for Indirect Effects of Flux in Coordination

Variable	Bias Corrected Confidence Intervals	
	Lower	Upper
Role Criticality	-.90	-.44

Note: Confidence interval does not include zero, thus the indirect effect is indeed significantly different from zero at $p < .05$ (two tailed) for role criticality.

Table 5.21
Effects Decomposition for Mediation

Independent Variable	Direct effect (unmediated effect)	Indirect effect (mediation by flux in coordination)	Total effect	R^2	F
Role Criticality	.15	-.67**	-.51	.55	24.72**

Note: $n = 108$. Controlled for time 2 task performance. * $p < .05$ ** $p < .01$

Moderated Mediation

Also conducted was a moderated mediation analysis, accounting for role criticality in the controllability/predictability-flux-task performance relationship, as suggested by Preacher et al. (2007). Often, it is of critical interest to determine whether or not a mediation effect remains constant across different contexts, groups of individuals, and values of the independent variable

(Preacher et al., 2007). Consequently, addressing the impact of role criticality on the controllability-flux relationship, predictability-flux relationship, and the flux-task performance relationship adds further explanatory power to the proposed model. As indicated in Table 5.19, both interaction terms are significant. That is, the controllability x role criticality interaction on flux (β = -.74, p < .001) and the flux x role criticality interaction on task performance (β = -.64, p < .001) are both significant. Moreover, the interaction holds when membership change is to a critical role as opposed to a non-critical role (i.e., indirect effect for change to critical role is .62, p < .001, non-critical role change is -.08, p = .414). Similar results are found for predictability, as can be seen in Table 5.20. The predictability x role criticality interaction on flux (β = -.71, p = .039) and the flux x role criticality interaction on task performance (β = -.43, p = .021) are both significant. Furthermore, the interaction holds when membership change is to a critical role as opposed to a non-critical role (i.e., indirect effect for change to critical role is .49, p = .002, non-critical role change is -.02, p = .732). Figure 5.2 shows the simple paths for both low and high role criticality conditions. Figure 5.3 graphs the interaction of controllability and role criticality on flux in coordination, and Figure 5.4 illustrates the flux-role criticality interaction on task performance. Concerning the moderated mediation for the predictability relationships, Figure 5.5 shows the predictability and role criticality interaction on flux in coordination whereas Figure 5.6 graphs the flux-role criticality interaction on task performance.

Table 5.22
Moderated Mediation Results of Role Criticality's Impact on Controllability-Flux-Task Performance Relationship

Interaction	***β***	***SE***
Controllability x Role Criticality	-.74**	.28
Flux x Role Criticality	-.64**	.19
Non-Critical Membership Change (Indirect Effect)	-.08	.10
Critical Membership Change (Indirect Effect)	.62**	.17

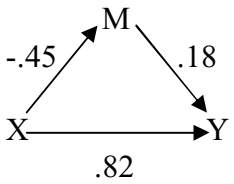
n = 107. Controlled for time 2 task performance, marketing experience, and major.
* p < .05 ** p < .01

Table 5.23
Moderated Mediation Results of Role Criticality's Impact on Predictability-Flux-Task Performance Relationship

Interaction	β	*SE*
Predictability x Role Criticality	-.71*	.34
Flux x Role Criticality	-.43*	.19
Non-Critical Membership Change (Indirect Effect)	-.08	.06
Critical Membership Change (Indirect Effect)	.62**	.17

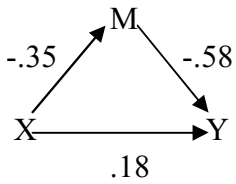
n =107. Controlled for time 2 task performance, marketing experience, and major.
* $p < .05$ ** $p < .01$

A. Simple Effects for Low Role Criticality



(Indirect Effect: -.082)

B. Simple Effects for High Role Criticality



(Indirect Effect: .62)

Note: Mediated models showing simple effects for low and high role criticality. For each model, *X* represents controllability, *M* signifies flux in coordination, and *Y* indicates task performance.

Figure 5.2
Simple Effects for Moderated Mediation: Role Criticality's Impact on the Controllability-Flux-Task Performance Relationship

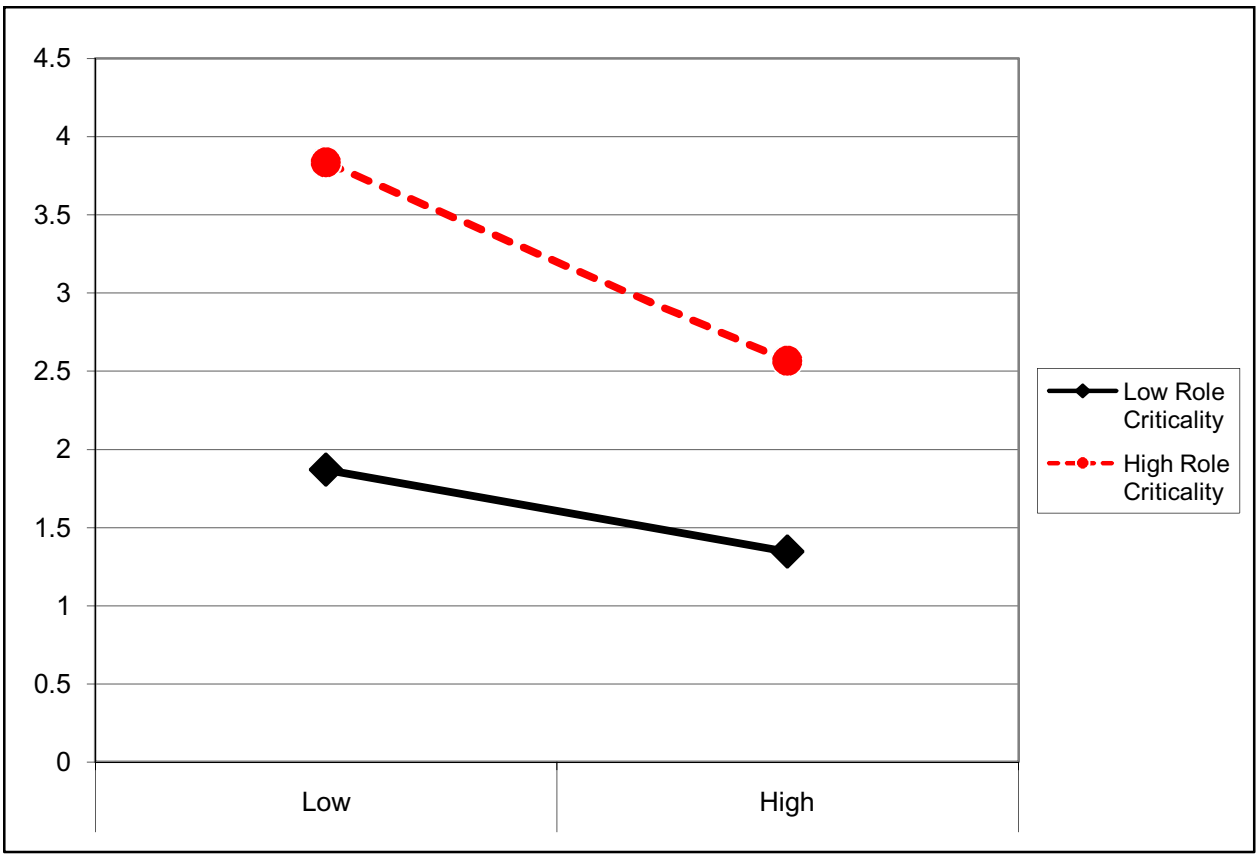


Figure 5.3
Controllability x Role Criticality on Flux in Coordination

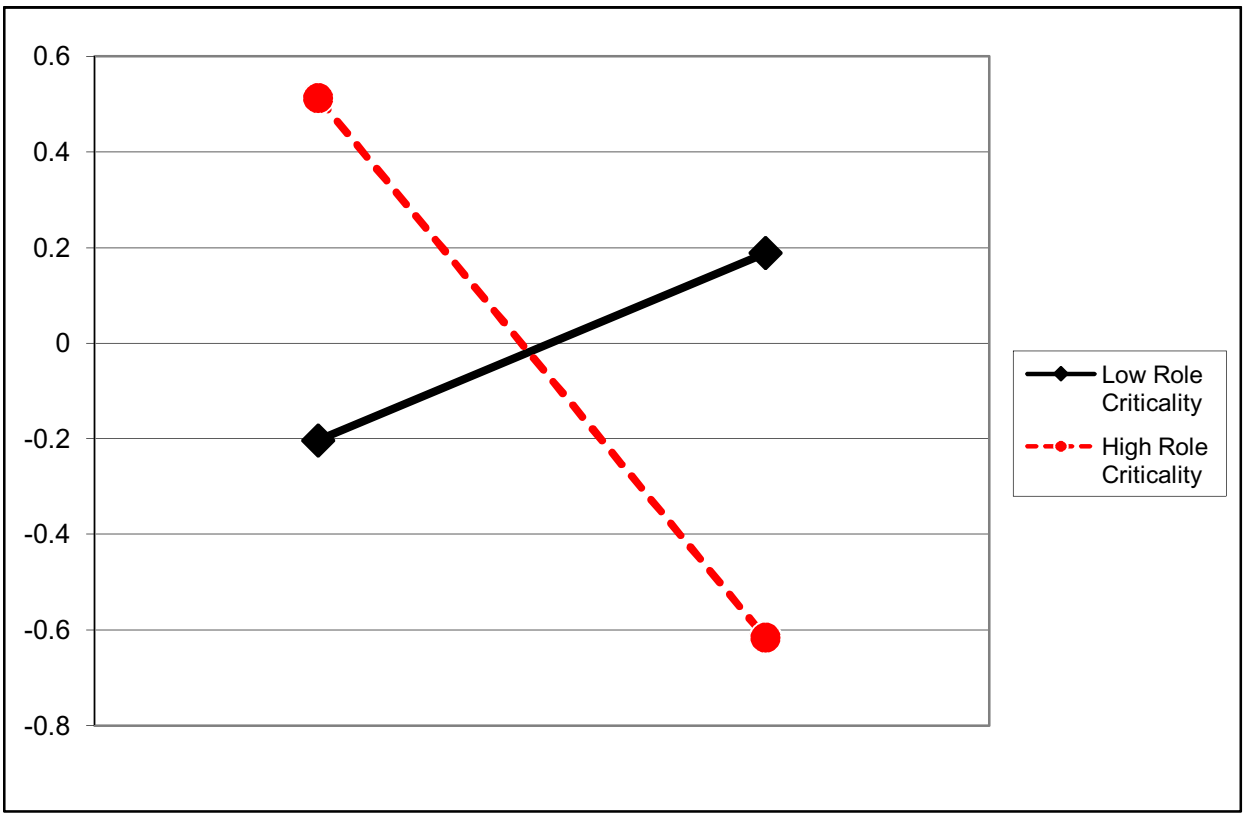


Figure 5.4
Flux in Coordination x Role Criticality on Task Performance (controllability)

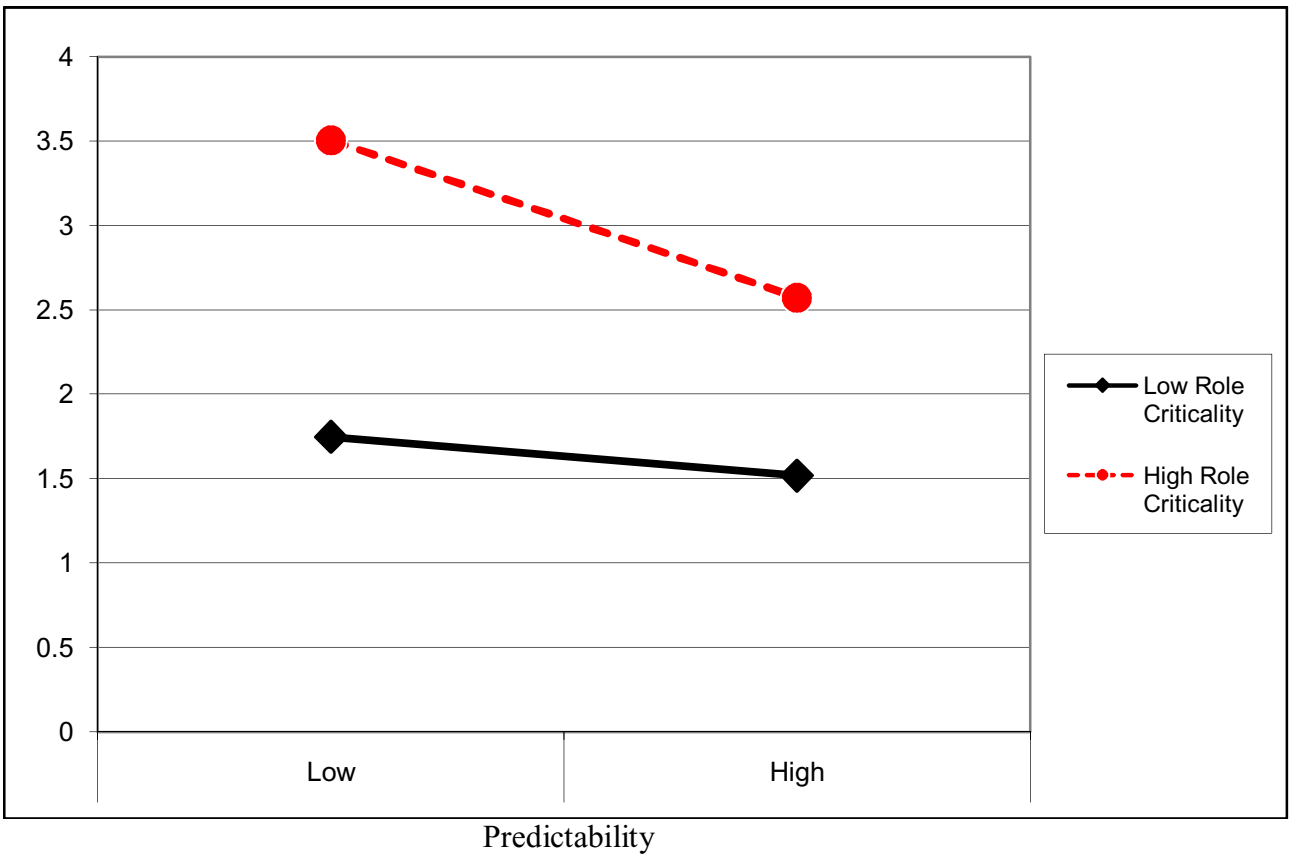


Figure 5.5
Predictability x Role Criticality on Flux in Coordination

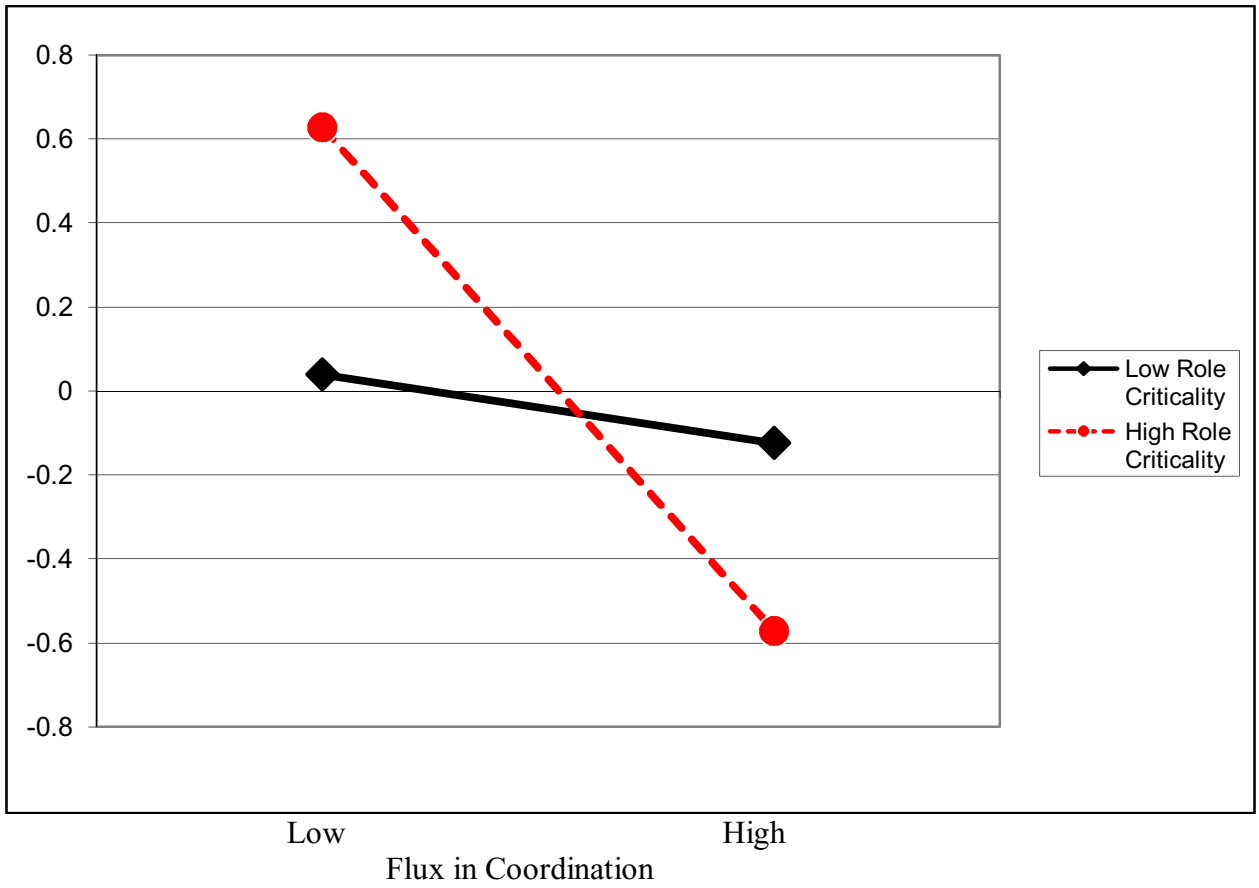


Figure 5.6
Flux in Coordination x Role Criticality on Task Performance (predictability)

CHAPTER 6

DISCUSSION

In this chapter, the results reported in Chapter 5 are discussed concerning the hypothesized and post-hoc relationships, as well as proposing possible explanations for the non-significant findings in this research. Next, the contributions of this dissertation are discussed, followed by the strengths and limitations. Finally, directions for future research are offered, as are practical implications of this dissertation.

Major Findings, Non-Findings, and Contributions

The present study investigated the influence of attributions team members make for changes in their membership. These attributions of controllability and predictability were hypothesized to affect the amount of flux teams experienced in their ability to coordinate their behavior effectively, which impacts their capacity to carry out their tasks and perform. The moderating effect of role criticality also was introduced in the attribution-flux relationship. The following section summarizes the findings of this research, and speculates about the reasons for these findings.

Attributions-Flux in Coordination Relationship

The first hypotheses examined the effects of team member attributions on the flux in coordination following membership change. In particular, it was hypothesized that attributions of controllability would lead to less flux than attributions of uncontrollability following membership change. Likewise, attributions of predictability, as opposed to unpredictability, should lead to less flux in coordination. Finally, it was hypothesized that there would be an interaction effect of attributions of controllability and predictability, such that when the team attributes member change as predictable and controllable, the flux will be the least, whereas when the team attributes member change as unpredictable and uncontrollable, the flux will be the greatest.

The results suggest that attributions of both controllability and predictability are important predictors of the amount of disruption, or flux, that teams experience following membership change. Past research investigating the impact of membership change on team functioning generally has treated membership change as a given, and not considered the impetus for membership change, or the "why change" question (see Bayazit & Mannix, 2003; Chen,

2005; De La Hera & Rodriguez, 1999; DeRue et al., 2008; Lewis et al., 2007). However, the current study focuses on the "why change" phenomenon and how that impacts team interaction, thus contributing to the team's literature.

Prior research also has emphasized that the ability to manage change depends on how unexpected that change is with regard to its controllability and predictability (McGrath & Beehr, 1990). The results presented here are consistent with prior theory and research that included these two variables in the process of managing change (McGrath & Beehr, 1991). Moreover, the contextual nature of the study and the results add to current theory on teams. However, the two attributions were not weighted equally, because controllability demonstrated a stronger impact on flux than did predictability. Prior theory has neither theoretically nor empirically delineated the differential impact of these two attributions. Thus, this study makes initial strides to do just that.

However, the interaction of controllability and predictability was not significant, which did not support Hypothesis 3, and did not correspond with McGrath and Beehr's (1990) theory. Several explanations could illuminate possibilities for these results. First, both variables exhibited strong main effects (i.e., accounting for a large amount of variance), thus potentially limiting the capacity to detect interactions. Second, the outsized impact of controllability on flux could perhaps negate any interaction effect with predictability.

Last, consistent with attribution theory (Heider, 1958; Martinko, 2004), team members sought to explain the membership change. Few studies have examined team attributions, and none were found that examined team attributions with regard to a change event. The results indicate that team members ascribed causation similarly, which goes beyond past research focusing on performance.

Moderating Function of Role Criticality

The next group of hypotheses predicted the moderating effect of role criticality on the attribution-flux in coordination relationship. More specifically, the hypothesized relationships (Hypotheses 4 and 5) between controllability (and predictability) and the flux in coordination caused by member change should be moderated by role criticality, such that when team member attributions for member change are uncontrollable (or unpredictable), role criticality increases the level of flux in coordination, whereas flux is not impacted by role criticality when the attribution is controllable (or predictable). The results indicated that the controllability role

criticality interaction was significant, but the predictability role criticality interaction was not significant.

One possible explanation for these results could be due to controllability's more pronounced impact on flux. When teams underwent membership change to a critical role, their ability to exercise control over the membership change lead to less flux than did their awareness that the membership was going to occur. This ability to exercise control (i.e., or at least perceived control) over the membership change allowed teams to reconstruct their coordination patterns more efficiently than if they had no control. On the other hand, predictability did not factor in as much to reconstruct their coordination patterns, because it was not as closely related to the criticality of the member changing.

This study further conceptually and empirically developed strategic core theory (Humphrey et al., 2009) by hypothesizing, measuring, and testing its effects within the context of change relationships. Strategic core theory proposes that certain positions are more important to team functioning than others. The results of this dissertation support that stance by demonstrating the negative impact on performance when critical team members are replaced. These results further contribute by examining the effect that additional explanatory variables (i.e., controllability and predictability) exhibit on the strategic core of teams (e.g., controllability lessens the negative impact of change to critical team members).

Also, this study adds to role theory with the notion of role criticality as an important construct within team contexts. Additionally, it contributes to role theory by examining, in greater detail, the idea of task roles (Mumford et al., 2008), by moving beyond the idea that "who changes" is not important. In fact, the results speak to this very point—the member changing impacts the nature in which the team is capable of interacting efficiently post membership change. Therefore, this dissertation makes contributions to a well-established theory (i.e., role theory; Kahn et al., 1964), as well as a recently developed theory (i.e., strategic core theory; Humphrey et al., 2009).

Flux as a Mediator

The last hypothesis proposed that flux in coordination mediated the attribution-task performance relationship. The results suggested that flux partially mediated both the controllability- and predictability-task performance relationship. Prior research examining the impact of change on teams typically has bypassed most mediators or processes, and focused,

exclusively on performance (for an exception see Lewis et al., 2007). This research suggests that when teams undergo membership change, they perceive disruptions to critical team processes, in the form of flux. Moreover, the idea of who is involved in the membership change also matters, because teams experiencing membership change to critical roles also reported higher levels of flux.

The notion of flux is a new construct that needs further theoretical and empirical development. However, this dissertation has empirically established the notion of flux in critical team processes (i.e., coordination). Thus, it contributes by introducing a new construct that researchers can use to investigate change. The flux construct is expected to be a multi-level construct that can be applied at any level of analysis. Future research by Summers et al. (2009) is aimed at developing a more informed understanding of the flux construct, and its role in organizational science research.

Results of Additional Data Analyses

The use of bootstrapping (Preacher et al., 2007) only further reiterates the meditational characteristics of flux in the attribution-performance relationship. Both controllability and predictability demonstrated significant indirect effects. Thus, the bootstrapping results further exhibit support for Hypothesis 6, and provide further support for the notion of flux.

In an effort to further examine the function of role criticality in the proposed model, hierarchical regression analyses were conducted with role criticality as a main effect variable on task performance. Role criticality produced the second highest beta coefficient, next to controllability. Thus, the results support the notion that role criticality could be considered a main effect, and not a moderating variable, which provides more evidence for the Humphrey et al. (2009) strategic core theory.

Additionally, because role criticality can be considered a main effect variable, the effect of flux as a mediator of the role criticality-performance relationship was examined. Although the Sobel test did not produce significant results for the indirect effect of flux as a mediator, the results from bootstrapping did, thus providing evidence of flux's mediating influence of the role criticality-performance relationship.

Also, it was determined to be of importance to conduct a moderated mediation analysis in order to determine if flux mediated the controllability- and predictability-task performance relationship under varying degrees of role criticality. Frequently, it is important to establish

whether or not a mediation effect remains constant across different contexts, groups of individuals, and values of the independent variable (Preacher et al., 2007). The results of this test indicate that flux mediates the attribution-task performance relationship under high role criticality conditions, thus further supporting the notion of flux and strategic core theory (Humphrey et al., 2009).

Strengths and Limitations

This dissertation has a number of strengths that warrant mentioning. First and foremost, individuals were randomly assigned to teams, and each team was randomly assigned to experimental manipulations in a longitudinal design. This type of experimental design allows for differences in cognitive ability and other personal attributes to be randomly distributed across teams and conditions, thereby methodologically controlling for various measured and unmeasured differences between teams. Additionally, this experimental design allows for inferences to be made regarding causality. Second, teams were composed of four members with differentiated roles, thus allowing for the development of team-like characteristics (Arrow et al., 2000). Team's research in the past frequently has studied two and three person teams with undifferentiated roles. Third, teams met at two different time periods before membership change was introduced at time 3. This takes into account that history matters (Moon et al., 2004), because a particular team's history may affect both the likelihood of a particular type of change, as well as how quickly the team will be able to deal with these changes. Fourth, a large sample size (n = 108) was utilized in this study, whereas many team's studies do not have more than 75 teams. Fifth, all manipulations and surveys were separated by time, thus reducing common method/common bias errors. Additionally, an objective performance criterion was used, thus eliminating self-serving bias and tendencies, as well as common method/common source errors, which are potentially problematic with subjective measures of performance.

In order to provide an accurate understanding of the results of this dissertation, it is also important to recognize some limitations of this research. First, what is presented is an initial experiment of a new concept tested in a laboratory setting. Although there are clear limits to what can be accomplished in laboratory settings, one needs to keep the nature of the research question in mind when assessing the relevance of external validity (Berkowitz & Donnerstein, 1982). Because no formal aspect of this theory implies that it would *not work* in this specific

context, this context provided a legitimate venue within which to test the theory. As Ilgen (1986) noted, this is precisely the type of question that is well suited to laboratory contexts.

Second, the participants in this experiment were undergraduate students engaging in an activity for course credit and cash prizes, and were not subject to the various "real-world" influences on organizational teams. On the one hand, this allowed for the reduction of contaminating influences on the dependent variable. On the other hand, it means that it raises questions that the findings will generalize to other populations.

A third limitation of the study was that the change implemented within teams was to one member at a time, where no other changes occurred to their task, their environment, or to their role structures. Further, new team members had prior experience in other teams performing a similar task. On the one hand, this control allowed for more focus on the hypothesized relationships, thus limiting noise. On the other hand, organizational teams typically have to deal with multiple issues simultaneously (Kozlowski, 1998).

Fourth, the only boundary condition examined in the study was role criticality. Certainly, there are a host of other factors that could influence the attribution-flux relationship. However, the purpose of this study was to investigate the role of membership change based upon unexpectedness and the criticality of the member involved in the change.

Lastly, the controllability and predictability manipulations are significantly correlated (r = .51). Ideally, the two manipulations would not be correlated. However, this phenomenon occurred due to non-response. Moreover, because no significant differences exist between the teams that were dropped due to non-response, the manipulations most likely are correlated due to differential mortality (Cook & Campbell, 1979). Furthermore, because regression analyses were conducted, rather than ANOVAs, the intercorrelations between manipulations during the data analysis were statistically addressed.

Directions for Future Research

The results of the present study pose a number of interesting directions for future research. First, the only moderator examined in this study was that of role criticality. Although it is beyond the scope of this study, future research should investigate the impact of other moderator variables that could affect the amount of flux experienced by teams undergoing change. As for other moderators, at the individual level, differences in personality (Barrick & Mount, 1991; Humphrey, Hollenbeck, Meyer, & Ilgen, 2007; Kinlaw, 1991; Varney, 1989) and

interpersonal competency (e.g., political skill; Ferris, Perrewé, Anthony, & Gilmore, 2000; Ferris, Treadway, Perrewé, Brouer, Douglas, & Lux, 2007; Perrewé, Zellars, Ferris, Rossi, Kacmar, & Ralston, 2004) could demonstrate differential effects on the processes in the context of team change. Similarly, the team-level factor of structure (Moon et al., 2003), and organizational-level factors, including the environment (Thompson, 1967; Weick, 1979) and reward structure (Johnson et al., 2006), could affect how team change impacts processes and effectiveness. Additionally, the context or specific situations (e.g., high pressure situations, task complexity) can have varying influences on the change-process relationship. Although a comprehensive analysis of the determinants of the suggested moderators is beyond the scope of this paper, exploring the plethora of potential determinants represents an important direction for extending the proposed framework.

A second opportunity for future research is to examine the impact of other team processes as mediators in the change-performance relationship. For this study, only the impact of flux in coordination was examined. Marks et al. (2001) proposed a temporally-based framework of team processes, which coordination was but one action-oriented process. Other processes such as conflict management, strategy formulation, and team monitoring are some that affect team effectiveness (Marks et al., 2001; Rousseau et al., 2006). Moreover, examining multiple-mediation models would be a logical next step to further elaborate on the notion of flux.

Although this dissertation focused solely on membership change, future research should explore other avenues of change that impact flux. Investigating the impact of role change in teams is an understudied area in team's research. Even though the conventional treatment of teams is that they have stable roles (Campbell, 1958; Guzzo & Dickson, 1996; Hackman, 1987; Sundstrom, 1999), the reality is that teams frequently experience role changes (Ancona, Bresman, & Kaeufer, 2002). Additionally, future research needs to both theorize and empirically examine the combined effects of role and member change on team processes and performance.

Fourth, by treating change as exogenous, the present research has not taken a stance on the effect of various antecedents of change. Although beyond the scope of the present dissertation, prior work has indicated that teams may change for a variety of reasons. Future research should examine antecedents of member and role change. For example, members may actively choose to reshuffle existing roles as a means of revitalizing the team (Boeker, 1997; Wiersema & Bantel, 1993), or changes may be imposed by management or some other external

force (Wiersema & Bantel, 1993). The source of change may have a different impact on how teams are able to cope with the change. Thus, future research should examine the moderating effect of a variety of endogenously and exogenously generated changes on the change-process-performance relationship.

To this point, factors have been discussed that impact the amount of flux that teams experience after some variety of change (i.e., membership change). The next step is to theoretically explicate, then empirically test, factors that resolve the post-change flux. For example, what role does time play? Do teams that experience large amounts of flux in the short run, do better in the long run? Research has examined the impact of disruptive events on immediate performance (Arrow, et al., 2000; Brett et al., 2003; Okhuysen, 2001; Zellmer-Bruhn, 2003). However, research has failed to examine the long-term effects of these disruptions, as the relationships could be curvilinear (e.g., short-term losses, long-term gains in performance or vice versa). Ferris, Bowen, Treadway, Hochwarter, Hall, and Perrewé (2006) called for more research investigating curvilinear relationships in the organizational sciences.

Sixth, because the phenomenon under investigation was examined in a laboratory setting, future research should pursue this topic in new contexts. Organizations and teams can experience membership change for a number of reasons (e.g., members can quit, be fired, promoted, or take a leave of absence), and examining these various forms of change on team interaction would apply the proposed theory in new contexts, thus testing the generalizability of the theory. Organizational contextual factors can have a tremendous influence on teams, as emphasized with the concept of job bracketing (Hackman, 2003; Mathieu & Taylor, 2007). The bracketing concept suggests that to thoroughly understand the dynamics of a given phenomenon of interest, scholars should consider influences that emanate from at least one layer "inside" and at least one layer "outside" of the focal level (Hackman, 2003).

Although the present study focused on how change impacted a single internal process within a team, Arrow et al. (2000) noted that the behavior of teams that experience "extreme destabilization" becomes unpredictable to outsiders. It may be worthwhile to investigate how change is viewed by external constituencies as well. For example, the innovation literature has suggested that product development teams must be able to provide appropriate justifications and explanations to various members of the organization in order to succeed (e.g., Ancona & Caldwell, 1992a, b; Dougherty, 1992; Dougherty & Heller, 1994; Tripsas & Gavetti, 2000;

Tushman & Katz, 1980). Similarly, organizational ecologists have argued that change is disruptive because it calls into question the organization's reliability and accountability (e.g., Hannan & Freeman, 1977, 1984; Stinchcombe, 1965), and others have found that equivocality in an organization's identity results in an illegitimacy discount (e.g., Zuckerman, 1999). The implication is that organizations need to be able to reduce the uncertainty for market participants by creating a coherent story that organizational stakeholders can use to make sense of the organization and its products (e.g., Weick, 1979, 1995). At a team level, this may mean that certain types of changes may require more of an explanation to external constituencies, and thus be more disruptive to the team and external evaluations of its performance. For example, regardless of criticality, changes in highly visible roles and members, such as when rock bands change their high-profile lead singers (e.g., Van Halen replacing David Lee Roth with Sammy Hagar), may create more external pressures for the team than when there is a change in a less visible role or individual.

Building off of Humphrey et al.'s (2009) theory of the strategic core, a number of role-level issues and questions surface. According to Bradford (1995), although successful role change is critical to sustaining and growing a dynamic and innovative team, ineffective role change can be detrimental to team performance. This leads us to search for other mediators that are of interest to future research, as the impact of role change on social loafing and other political and social influence behaviors or processes deserve addressing. It may be the case that the negotiation or posturing of roles among members that can surface as a result of role ambiguity and role conflict can be a major avenue of research in the largely untapped arena of social influence within teams. Furthermore, even though new member socialization has been studied within the team context (Chen, 2005; Chen & Klimoski, 2003), future research should differentiate between the socialization characteristics of peripheral versus core roles.

Also, this study included individual team members occupying a certain role. The very nature of the study lends itself to hierarchical linear modeling, as it has roles nested within teams across time. Thus, future research should examine the multi-level effects of the nested nature of this experiment.

Lastly, team research has commonly stressed cognitive processes (Ilgen et al., 2005), even though George (1990) called attention to the value of affect for team outcomes more than a decade and a half ago. Of late, researchers have begun to examine affective processes in teams,

with affective linkages between team members (i.e., the extent to which the affective states of team members covary; Totterdell, Kellett, Teuchmann, & Briner, 1998). Such attention to affective processes in teams coincides with the revitalized interest in emotions and affect being studied in other areas of organizational research (Barsade, Brief, & Spataro, 2003; Brief & Weiss, 2002). Ilies, Wagner, and Morgeson (2007) have since examined emotional contagion susceptibility in individualistic- versus collectivist-oriented teams. Future research should examine the emotional contagion susceptibility to teams as a function of critical team members. That is, do the emotional states of critical or prominent team members affect the emotional states of the rest of the team more than do peripheral team members?

Practical Implications

Although this study was performed in a laboratory setting, the findings suggest several practical implications. The first implications suggested are top-down influences that are derived from the organization level down to the team level. Central to the current study are the ideas of controllability and predictability. When a critical team member withdraws from the team, the knowledge, skills, and abilities (KSAs) also are removed. More importantly, the tacit knowledge (Berman, Down, & Hill, 2002) of the prior team member typically is not transferred upon leaving. The findings suggest that when team members perceive control over the membership change, the team experiences less disruption in the coordination processes. Thus, instituting more control mechanisms, such as job rotation, management information systems, or allowing, when possible, the transferring of tacit knowledge via training, will provide for more control, which should reduce the amount of disruption the team experiences in its ability to interact efficiently. The less time it takes to reconstruct its coordination, the more quickly the team will be operating at efficient levels.

As for the predictability of turnover or membership change, ensuring that proper communication is taking place both among team members and between teams and the organization is paramount to managing change from any source (Ford & Ford, 1995). Knowing in advance that a team member is leaving allows organizational members to either find and train a replacement for the vacant position, or allow an existing member to absorb those roles and hire a new member to take that team member's position. In addition, knowing in advance a member is leaving reduces the shock factor, which allows for negative emotions and stress to be alleviated (McGrath & Beehr, 1990).

This research also has demonstrated the importance of core role holders, a notion that organizations need to attend to more (Humphrey et al., 2009; Huselid, Beatty, & Becker, 2005). When teams are struck by turnover to their key positions or roles, this causes much more disruption in the manner in which they interact or coordinate their behavior in order to complete tasks. This loss of efficiency hinders performance, which can exhibit detrimental effects on organizational outcomes. From a human resource management perspective, it is imperative that organizations replace core role holders with talented personnel, because it is those individuals who are responsible for carrying out tasks and behaviors critical to the success of the organization (Huselid et al., 2005). Replacement with inferior personnel could have a detrimental impact on the team and organization.

Conclusion

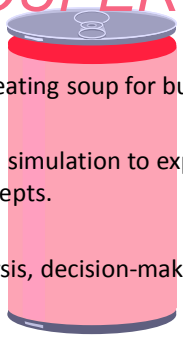
The objective of this dissertation was to examine the impact of team member attributions of controllability and predictability following membership change on the flux experienced in the team's coordination, depending on the team member's criticality to the team. Using a sample of 108 teams, the researcher found support four of the six hypothesized relationships. In particular, both controllability and predictability were shown to attenuate the flux in coordination following membership change. Moreover, the results demonstrate that flux mediated the attribution-performance relationship, such that increases in flux resulted in low levels of performance. Hopefully, this study has generated insight, and stimulates further research in this area.

APPENDIX 1

SOUPER HOT POWERPOINTS

New Product Alert - New Product Alert - New Product Alert

SOUPER HOT



The innovative self-heating soup for busy people on the move.

A short computerized simulation to explore essential marketing and financial concepts.

To build skills in analysis, decision-making and team working.

The Task

You will be divided into small groups to run the Souper Hot company for at least eight periods.

You will use micro-computers to simulate the effect of your decisions.

The Good News

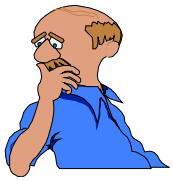
- Souper Hot is a totally new product
- and there is no competition
- Each period, potential sales are 1,000,000
- It only costs $0.50 to make
- but you should be able to sell it for $2.00

The Bad News

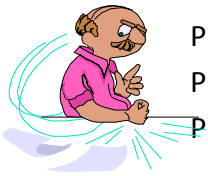
- Eventually competition will arrive.
- No one knows about Souper Hot.
- Fixed Costs (each period) are $20,000.
- Every time you increase production you invest $2 per unit of new capacity.
- Souper Hot has a limited shelf-life and so you lose half any inventory remaining at period end.

The Even Worse News!

- You only have $400,000 to fund your growth.
- If you over spend on
  - production capacity
  - inventory
  - initial losses
- You may go bankrupt!



Your Decisions



PRICE	1.90
PROMOTION	75000
PRODUCTION	70000

Besides illustrating the decisions, these have been tested and a forecast of the results produced.

Your Results

Penetration	5
Market Share	100
Unit Sales	50000
Inventory (units)	10000
Sales Income	95000
Net Profit	-30000
Fixed Assets	140000
Inventory (value)	5000
Cash	225000
Cum Profit	-30000

Using the Computer

Enter a team name

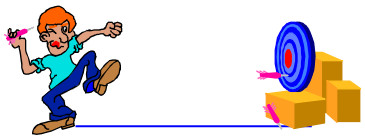
- to identify your data and demonstrate creativity, aggression etc.

Enter Decisions into the template & confirm

Results will be printed and displayed

Analyze and make your next decisions

YOUR OBJECTIVES



- run the business for at least eight periods
- make the greatest possible cumulative profit
- without going bankrupt
- explore essential marketing & finance
- practice your decision-making skills
- work as a team sharing understanding
- HAVE FUN!

APPENDIX 2

SURVEY INSTRUMENTS

Team Processes and Effectiveness Survey

You are invited to complete a survey as part of a research study conducted by members from the Department of Management. The purpose of this survey and simulation is to learn about the effect that change has on team processes and team effectiveness through a product launch simulation.

Your participation in the research should take approximately one hour across four meeting times. Completing the survey and returning it implies your consent to participate in this research. This research is of minimal risk to you. There will be no deception, nor will you be put in morally ambiguous situations that might cause psychological stress.

Your privacy will be protected to the maximum extent allowable by law. You will only be asked your name in order to match your responses across time. Once all of the data has been collected, your name will be removed from the dataset. The report will not include any information that will allow anyone to identify any of your individual responses. The data will be stored on a password-protected server, which will be accessible only by the research team. The data will be kept for at least 5 years in accordance with American Psychological Association (APA) guidelines.

We thank you for taking time out of your busy schedule to contribute to this project. Your thoughts and comments will be invaluable to us. If you would like to receive information about the results of this study, please indicate your name and contact information on the form included with this survey.

If you have any questions about this study, please contact:

Jim Summers in the Management Department (phone: 850-644-2038, email: jks04d@fsu.edu),

Dr. Jerry Ferris (Dissertation Chair) in the Management Department (phone: 850-644-3548, email: gferris@cob.fsu.edu),

Chair of the Human Subjects Committee, Institutional Review Board, through the Office of the Vice President for Research at 850-644-9694.

Please turn to the next page and begin the survey.

Wonderlic Protocol (Bold type represents what is to be said out loud to participants)

Next, we are going to have you complete the Wonderlic Personnel Test. The Wonderlic is a test of problem solving ability, used by a lot of organizations for selection purposes. You have 12 minutes to answer as many questions as you can, writing the answers directly on the sheet. Please put your name on the front page (do not fill in the social security number) and read through the instructions.

When they are ready, start the stopwatch. Stop them at 12 minutes.

Controllability and Predictability
CDSII Revised Causal Dimension Scale McAuley, Duncan, & Russell (1992)
Instructions: Think about the reason or reasons for the team member change. The items below concern your impressions or opinions of this cause or causes of the member change. Circle one number for each of the following questions.

Team Controllability
Is the cause(s) something:

1.	Manageable by the team	1 2 3 4 5	not manageable by the team
2.	The team can regulate	1 2 3 4 5	the team cannot regulate
3.	Over which the team has power	1 2 3 4 5	over which the team has no power

Outside Control

Is the cause(s) something:

1.	Over which others have control	1 2 3 4 5	over which others have no control
2.	Under the power of other people	1 2 3 4 5	not under the power of other people
3.	Other people can regulate	1 2 3 4 5	other people cannot regulate

Predictability

Is the cause(s) something:

1.	Predictable by the team	1 2 3 4 5	not predictable by the team
2.	Not Surprising	1 2 3 4 5	surprising
3.	Foreseeable by the team	1 2 3 4 5	not foreseeable by the team

Flux in Coordination (Adapted from Lewis, 2003)

Think about how the recent member change affected coordination in your team.

This change …

1. Caused disruptions in the way the team carried out its tasks.
2. Increased the number of misunderstandings about what to do.
3. Created more instability in the way the team interacted.
4. Made accomplishing the task more difficult.

Role Criticality

The following items concern the team member who has recently left the team. Please respond to each statement as it applies to the success of the team.

1. Encountered more of the problems that needed to be overcome in order for the team to be successful.
2. Was essential to the output of the team.
3. Had a greater exposure to the tasks that the team was performing.
4. Was more central to the workflow of the team.
5. Was critical to the success of the team.

Note. All items use a 5-point disagree–agree response format, in which 1 _ *strongly disagree,* 2 _ *disagree,* 3 _ *neutral,* 4 _ *agree,* and 5 _ *strongly agree.*

Subjective Measure of Task Performance

1. The team performed the task as well as could be expected.
2. I feel that my team performed as well or better than other teams.
3. Overall, the team was successful in performing its tasks.

Note. All items use a 5-point disagree–agree response format, in which 1 _ *strongly disagree,* 2 _ *disagree,* 3 _ *neutral,* 4 _ *agree,* and 5 _ *strongly agree.*

Background Information

Major_____

Marketing or advertising experience (in months)_____

APPENDIX 3

HUMAN SUBJECTS APPROVAL FORM

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 6/25/2008

To: James Summers

Address: 821 Academic Way P.O. Box 3061110 Tallahassee, FL 32306-1110
Dept.: COLLEGE OF BUSINESS

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
An Investigation to the Impact of Membership Change on Critical Team Processes

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be Expedited per 45 CFR § 46.110(7) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 6/19/2009 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Gerald Ferris, Advisor
HSC No. 2008.1518

APPENDIX 4

PROTOCOL FOR ROLES IN SOUPERHOT

Vice President of Production

- Responsible for making decisions for setting the amount of units to produce.
- Responsible for making decisions for setting the price of SouperHot.
- Responsible for running the SouperHot program.
- Responsible for entering all decision matrices.
- Responsible for saving data to diskette.
- Responsible for turning in diskette to the individual running the teams' lab.
- Responsible for making sure each team member fills out mandatory paperwork following the simulation run.
- Responsible for ensuring all mandatory paperwork is turned into the individual running the teams' lab.
- Keep individual notes on what has been done as well as what to do in the future.

Vice President of Marketing

- Responsible for making decisions for setting the amount of money to invest in promotion.
- Keep individual notes on what has been done as well as what to do in the future.

Vice President of Finance

- Responsible for assisting the VP of Production and the VP of Marketing in their decisions by analyzing cash flow, sales, and profits.
- Keep individual notes on what has been done as well as what to do in the future.

Notes for the Team

- Each individual role will be held accountable for their responsibilities.
- Each team member should hold each other responsible for their respective roles, which includes taking notes.

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