The Effects of Group Personality Composition on Project Team Performance:

Operationalizations and Outcomes

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DEDICATION

This dissertation is dedicated to my late mother, Lois Collins; my father, Dr. Bob Collins; and my wife, Sharon Cooper Collins. Without your unwavering love and support, I could never have accomplished this.

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ABSTRACT

Teams are used to achieve organizational goals and objectives, and their success has led to a broad increase in their use in businesses, non-profits and NGO's. Extant research suggests that group personality composition is related to team performance (Barry and Stewart, 1996; Halfhill, Nielsen, Sundstrom, and Weilbaecher, 2005; Peeters, Rutte, Tuijl, and Reymen, 2006; Bell, 2007). Project teams are frequently used in the business world and undertake a wide variety of tasks (Hackman, 1990). This paper investigates the relationship between the group personality composition of project teams and team performance. The study context is project teams involved in a semester-long business simulation in an undergraduate core capstone course at a large R-1 public university. Hierarchical regression is used to first remove any effect stemming from variables that are not of direct interest, such as team size and course section. The study's nine hypotheses are then tested using the collected data. The research results are discussed in detail. Contributions to both research and practice are considered, as well as the study's limitations. A continued stream of research is envisioned and detailed, followed by the study's conclusions.

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CHAPTER 1 – INTRODUCTION AND STUDY RATIONALE

Following the financial sector collapse of 2007-2008, nations around the world have uniformly reported decreased economic output and increased unemployment, leading to lowered buyer confidence and consumption (Colvin, 2008). Consequently, firm revenues and corresponding earnings have declined precipitously across virtually every industry. These powerful forces have led to new levels of competitive rivalry (Porter, 1979) that are both relentlessly dynamic and brutally efficient (Brooks, 2012). Combined with diminishing resources, a hypercompetitive globalized economy, and weakening profit reports, the margin of error in business management has narrowed in recent years as many firms' competitive edge are threatened (The Economist, 2013). Against that formidable backdrop, organizations are actively seeking paths to greater success through new efficiencies and improved effectiveness.

Work teams are important and have proven central to organizations' success. Such units have long been utilized to achieve vital organizational goals and objectives (Hackman, 1990) and now are essential to organizational success in meeting economic, social, and technological challenges (Thatcher and Patel, 2012); however, many companies are still struggling to cultivate their own teams to perform more effectively (Colvin, 2012). Their proven value has led to a broad increase in work done in small groups for businesses, non-profits, and non-government organizations (Ilgen, Hollenbeck, Johnson, and Jundt, 2005), yet for all the promise shown in utilizing small groups, management research has seen only modest advancement in understanding why some work teams succeed while others disappoint. This previous research has investigated different reasons for varying group performance, such as how and when work teams are used, the types of tasks the work teams are assigned, and differences in individual team members.

Firms and organizations of all kinds struggle to understand and act on differences in employee teams, and this challenge has led to broad research on diversity variables such as demographics variables, values, skills, pay and personality (Harrison and Klein, 2007). Although the existing literature suggests that some characteristics, such as the surface-level diversity within the team (e.g., race, ethnicity, and gender), may lead to greater conflict, improved communications quality, and ultimately success, the black box in team research remains the differences and similarities between team members (Lawrence, 1997). Furthermore, work groups are significantly more diverse in recent years and will continue to become even more diverse in the years to come (van Knippenberg, DeDreu and Homan, 2004; van Knippenberg and Shippers, 2007), adding more motivation for management research to expand our understanding of work group diversity on team performance.

One promising area of research in team diversity is group personality composition (Barry and Stewart, 1997; Halfhill, Sundstrom, Lahner, Calderone, and Nielsen, 2005; Peeters, Rutte, Tuijl, and Reymen, 2008; Bell, 2007). Group personality composition (GPC) research concentrates on the configuration of personality traits seen in individual team members and the corresponding effect on team performance. Among current trends in the study of GPC is the operationalization of the well-established five-factor model of personality traits (Costa and McCrae, 1976). Although some research results have been divergent (Barrick, Stewart, Neubert, and Mount, 1998; Neuman, Wagner, and Christiansen, 1999), several studies have indicated a significant and considerable relationship between the mix of personality traits among team members and the teams' performance (Barry and Stewart, 1997; Halfhill, Nielson, Sundstrom, and Weilbaecher 2005; Halfhill, Nielson, and Sundstrom, 2008; Neuman and Wright, 1999). This is the right time in the research stream for further investigation into how divergent or

similar group personality compositions affect team performance and is beneficial to our understanding of the relationship.

Purpose of the Study

Although significant research has focused on team diversity, much is still unclear about the effects of this phenomenon and the topic is in need of further empirical study and clarification (van Knippenberg and Schippers, 2007; Prewett, Walvoord, Stilson, Rossi, and Brannick, 2009). The purpose of this study is to advance understanding in management research about team diversity as conceptualized by the group personality composition construct and paint a more accurate and useful picture of team diversity's effect on team performance. Furthermore, this study can better inform manager practitioners about the effects of personality composition on project team performance. Two significant managerial benefits are evident. The best-case scenario would be for team coordinators to survey potential group members' personality traits before the actual creation and deployment of the team. With that information in hand, the coordinator could maximize the positives identified in this study while avoiding the negative combinations. Perhaps more likely, managers directing previously existing project teams could use this research ex post facto to understand group personality combinations and assist their teams through active coaching and facilitation.

Research Problem and Research Questions

The central research problem examined is why some teams produce better performance outcomes than others. More specifically, the research questions are threefold:

1) Does the group personality composition of a team affect its performance?

2) To what degree does each specific group personality trait predict team performance?

3) To what degree does group personality trait operationalization predict team performance?

Statement of Hypotheses

Examined at the team level of analysis, this study will investigate the main effect between team diversity and performance, employing a well-accepted and vetted psychometric personality instrument to accurately measure group personality composition in teams. Accordingly, proper statistical tools are applied to examine the differences and similarities between each team and an objective and meaningful dependent variable to accurately measure differences in outcomes for these teams.

Importance of the Study and Contributions

This study heeds calls in prior group personality research for field studies rather than laboratory experiments (Halfhill et al., 2005), increased use of quantitative outcome variables (Peeters, Rutte, Tuijl, and Reymen, 2006), and for larger sample sizes (Peeters et al., 2006; Prewett, Walvoord, Stilson, Rossi, and Brannick, 2009). Additionally, a modern organization's ability to quickly form an effective team to solve problems is critical to its success (The Economist, 2006). To help gain a better understanding of the effect of group personality composition on team performance, managers who form or direct these teams can benefit in two important ways. For a work team undertaking a task critical to the organization, teams can be selected and formed with group personality composition used as a significant factor in member selection. Secondly, when a team is already formed and operating, the directing manager can consider group personality composition when investigating results that vary from expectations, and then either counsel team members as to which personality combinations exist within their

team and what the effects of that configuration are, or, for more serious situations, evaluate the need to move around and replace members to change or neutralize undesired GPC effects. Recently have researchers started to examine the relationship between team diversity, defined as group personality composition, and performance, and this point of view is rapidly gaining support.

Definitions of Key Terms

Groups and Work Teams

"Wherever people work together or play together they do so as a team." (Drucker, 1992).

The notion of "teams" has been loosely applied to dyads, small groups, organizations, and entire enterprises (Bradley, 2008). Collective behavior takes place at the group, organizational, and societal level. Within these three broad levels, groups consist of mutually responsive individuals, organizations consist of mutually responsive groups, and societies consist of mutually responsive organizations (Steiner, 1972); therefore, organizations are composed of individuals who work together (Gist, Locke, and Taylor, 1987). Additionally, Alderfer (1977) and Hackman (1987) defined a work group as a unit comprised of individuals who: see themselves and, are seen by others, as a social entity; are interdependent because of the tasks they perform as members of a group; are imbedded in a larger social structure such as a university or corporation; and perform tasks that affect others such as patients, customers, and coworkers. Furthermore, teams are sets of individuals who interact interdependently to achieve a common objective (Baker and Salas, 1996; Bell, 2007) and share common histories and

anticipate the same futures (Steiner, 1972). Lastly, work group and work team are defined as interdependent collections of individuals who share responsibility for specific outcomes for their organizations (Sundstrom, DeMeuse, and Futrell, 1990). This study will view a team as a small group of two or more individuals who work together interdependently; perform tasks that affect team objectives, goals, and others; and see themselves, and are seen by others, as a "team."

There has been some debate in the literature regarding the meanings of "groups" and "teams". Although some researchers believe teams to be evolved work groups whose members share commitment and strive for synergy (Katzenbach and Smith, 1993), others believe that consistent modern definitions of groups apply equally well to groups or teams (Alderfer, 1977; Hackman, 1980; McGrath and Kravitz, 1982) and feel that team has overtaken group in frequency of use, at least in organizational psychology (Guzzo and Dickson, 1996). This dissertation concurs with the latter views and will thus use the terms "group", "work group," and "team" interchangeably.

Project Teams

Unlike other types of teams, project teams undertake defined, specialized, time-limited projects and disperse after competition. Under McGrath's (1984) typology, project teams are constrained in both time and scope, providing ideal units for research investigation. Furthermore, such teams are commonly cross-functional in affiliation, meaning that their members may originate from different departments, units, or divisions, such as in engineering project teams and new-product-development groups (e.g., Ancona and Caldwell, 1992).

Team Diversity

Team diversity is the distribution of differences among the team members with respect to a common attribute, such as humor, tenure, or a given personality trait (Tsui, Egan, and O'Reilly, 1992; Simons, Pelled, and Smith, 1999; Pelled, Eisenhardt, and Xin, 1999; Harrison and Klein, 2007; Riordan and Wayne, 2008).

Team diversity can be further broken down into demography and process dimensions (Smith, Smith, Olian, Sims, O'Bannon and Scully, 1994). Demography includes the aggregated external characteristics of the team such as heterogeneity, tenure, and size, and is an important causal variable for both team practices and, through them, organizational performance (Pfeffer, 1993). Process focuses on the teams' actions and behaviors and psychological dimensions, such as communications for the former and social integrations for the latter (Smith et al., 1994). This research will focus on the team diversity dimension and will therefore define team diversity as the distribution of psychological dimensions among team members in regard to any single common element, such as personality traits.

Team Tasks

A group task is defined a set of behaviors or actions that someone is required to take to accomplish some specific purpose and begins with that end state in focus and the rules, specifications and constraints that govern the manner in which the task can be successfully accomplished (Steiner, 1972). Steiner's typology (1972) focuses on two broad categories of group tasks, unitary tasks and divisible tasks, explained in the next section. *Unitary tasks* are tasks that cannot be efficiently divided into subtasks performed by separate team members. With unitary tasks, mutual assistance between team members is not possible and team outcomes are

reached by individuals. Conversely, *divisible tasks* occur when work assignments can be broken into subtasks and performed by two or more team members. The group may be successful even though no single member of the team could accomplish the entire task on their own. Project teams commonly face both unitary and divisible tasks.

Personality

Although many similar definitions abound, this research will build on personality as "the complex organization of cognitions, affects, and behaviors that give direction and pattern (coherence to the person's life)" (Pervin, 1996, p.414); and furthermore asserts that personality includes "the individual's characteristics patterns of thought emotions and behavior together with the psychological mechanisms—hidden or not—behind those patterns" (Funder, 1997, p.1). Important to the present research, personality psychology's central focus is examining all the ways in which individuals differ from one another (Funder, 1997, p.6).

Personality Traits

Although reified in recent years, personality traits are neither real entities nor per se observable. Rather, traits are descriptive frameworks and serve a needed structural purpose by giving conceptual order to an otherwise complex psychological entity (Dumont, 2010). Personality traits are fundamental and exist in all cultures (Galton, 1949) and can be found in the natural language of all human groups, a concept termed the "fundamental lexical hypothesis." A society creates words to identify and describe the qualities of individuals in order to improve social interaction, enhance the general quality of life, and assist humans in living and working in close proximity with each other (Goldberg, 1990). Despite the past discussions and even heated debate on the subject, there is no longer any question about the primacy of personality (Kehoe,

2012). Additionally, further researcher consensus has emerged around the Five Factor Model view of personality (McCrae and Costa, 1987) that is discussed in the following section.

Five Factor Model

The Five Factor Model (FFM) of personality traits evolved over much of the twentieth century. From Thurstone (1934) to Fiske (1949), Tupes and Christal (1961), and Cattell (1950), different terminology has been used by numerous researchers to describe similar personality dispositions (Dumont, 2010). Costa and McCrae (1976, 1983) identified and reported neuroticism, extraversion, and openness as derived from a cluster analysis and later added conscientiousness and agreeableness (Pervin and John, 1999). The FFM is the "latitude and longitude along which any new personality construct should be mapped" (Funder, 2001; Goldberg, 1990; Ozer and Reise, 1994) and the personality psychology field is approaching consensus on acknowledging the general FFM dimensions as its accepted taxonomy (John and Srivastava, 1999).

McCrae and Costa (1987) clarified the five factor traits in the following manner. *Extraversion* (also termed surgency) includes variables such as social, fun loving, affectionate, friendly, and talkative. *Conscientiousness* describes adherence to socially prescribed rules and norms for impulse control, in being task- and goal-directed, and in being able to delay gratification (John and Srivastava, 1999) and discriminates between individuals who are orderly, industrious, and plan-oriented and those who are undisciplined, lazy, and unreliable (Hampson, 2012). *Agreeableness* is associated with kindness, unselfishness, generosity, and fairness (Goldberg, 1992) and agreeable people strive more for cooperation rather than competition (Costa and McCrae, 1992). *Openness* is one of the more recent broad personality traits identified

(Costa and McCrae, 1983), the most difficult to identify and interpret (Barrick and Mount, 1991), and is often the most difficult to grasp. The trait is seen in "the breadth, depth, and permeability of consciousness" (McCrae and Costa, 1997). *Neuroticism* is the chronic tendency of an individual to experience more negative thoughts and feelings than others, to be emotionally unstable, and to be insecure (Hampson, 2012). In this study, the positive trait of emotional stability, the reciprocal of neuroticism, will be used.

Group Personality Composition

Based on the FFM (McCrae and Costa, 1987), Group Personality Composition is measured by examining the group-level mean and variance as well as the individual-level minimum or maximum of the personality scores of each member of a particular work group (Barry and Stewart, 1997; Halfhill, Nielson, Sundstrom, and Weilbaecher 2005; Halfhill, Nielson, and Sundstrom, 2008; Neuman and Wright, 1999). The measurements do not convey any useful meaning until compared to other similar teams and a meaningful dependent variable.

Scope and Delimitations of the Study

The scope of this study is focused on project teams working towards specific goals in a time-constrained environment where all team members face real and significant consequences for either success or failure. The project teams are relatively small with three to five members and the project time frame is approximately 14 weeks.

The sample is undergraduate business majors at a large American public university in a business-core capstone course that must be passed with a grade of C or better to progress to their senior year studies and graduation. Although there has been criticism of student sample usage

(McNemar, 1946; Sears, 1986; Peterson, 2001), that sample choice is frequently used in GPC research (Barry and Stewart, 1997; Graziano, Hair, and Finch, 1997; Kichuk and Wiesner, 1997; Waung and Brice, 1998; Mohammed and Angell, 2003; Waldman, Atwater and Davidson, 2004; Mohammed and Angell, 2004; Baer, Oldham, Jacobsohn, and Hollingshead, 2008; Peeters, Rutte, Tuijl, and Reymen, 2008; Humphrey, Hollenbeck, Meyer, and Ilgen, 2011; and O'Neill and Allen, 2011).

Outlines of Subsequent Chapters

This dissertation is comprised of five chapters. This first chapter has introduced the general research questions, setting, and purpose for the present study. Chapter 2 presents a focused review of the research field and relevant literature and the hypotheses developed for this study. Chapter 3 describes the research sample, methodology, and analytic techniques used to answer the research questions and evaluate the nine hypotheses described above. Chapter 4 provides a discussion of the quantitative and qualitative findings of this study as well as the caveats associated with this particular project and the challenges related to interpreting the hypothesis tests. Chapter 5 offers a discussion of the theoretical and managerial implications of this research and provides suggestions, important questions for future research that might hopefully evolve from the present study, and concludes with a brief summary.

CHAPTER 2 - LITERATURE REVIEW

This literature review presents the current research on teams, team diversity, project teams and their task types, personality, and group personality composition, and concludes with the hypotheses put forth and investigated in this dissertation.

Teams

Definition of Teams

Research suggests that consistent modern definitions of group apply equally well to groups or teams (Alderfer, 1977; Hackman, 1980; McGrath and Kravitz, 1982) and that team has overtaken group in frequency of use in some disciplines (Guzzo and Dickson, 1996). This research will use the terms "group", "work group" and "team" interchangeably.

Importance of Teams

Groups have pervasive, persistent and powerful effects (McGrath, 1984). Human participation in organizing team tasks and working in groups dates back millennium, as evidenced by over ten thousand mounds stretching from Wisconsin to Florida built by Native American tribal teams beginning around 2000 BC. These elaborate earthen shrines required moving millions of pounds of soil by teams using only small hand-carried baskets, the reformation of the dirt, and the tamping down by foot (Strickland and Boswell, 2007). In the modern world, the use of teams in organizations has become so common that they are considered ubiquitous (Devine, 2002). Groups and teams are "real" because they have "real" effects (Lewin, 1948). Organizations increasingly rely on teams to reach organizational goals and objectives (Lawler, Mohrman, and Ledford, 1995; Sundstrom, 1999; and Baer, Oldham,

Jacobsohn and Hollingshead, 2008) and the use of work teams is pivotal and transformational for organizations (Goodman, Ravlin, and Schminke, 1987; Sundstrom, De Meuse, and Futrell, 1990; Barrick, Stewart, Neubert, and Mount, 1998).

Different types of teams have been identified in the research (Hackman, 1990) with differing dynamics and tasks (Steiner, 1972). The type of team is an important variable that has been largely ignored in previous group personality research. Indeed, there are different kinds of groups and those differences matter (Hackman, 1987). The next section will define and describe the focus of this study, project teams.

Project Teams

Project teams undertake defined, specialized, time-limited projects and disperse after competition. Under McGrath's (1984) typology, project teams are constrained in both time and scope, providing ideal units for research investigation. Furthermore, such teams are commonly cross-functional in affiliation, meaning that their members may originate from different departments, units, or divisions, such as in engineering project teams and new-product-development groups (e.g., Ancona and Caldwell, 1992). Project teams involve significant application of knowledge, judgment, and expertise (Cohen and Bailey, 1997). Moreover, while other teams are shaped over time through the attraction-selection-attrition process and the team members become more similar (Schneider, 1987), project teams, with their temporary nature, are better suited for a clearer view of non-ASA (attraction-selection-attrition) related phenomena such as group personality composition. The next section will focus on the types of tasks that teams undertake.

Team Tasks

Previous research indicates that task can moderate the relationship between team composition and performance (Steiner, 1972; Neuman and Wright, 1999) and therefore a significant portion of team research involves classifying groups on the basis of properties of the collective task. How well a group performs is dependent on the adequacies of the resources each member brings to the group and the manner in which the resources are organized and applied. A group task is a set of behaviors or actions that someone is required to take to accomplish some specific purpose and begins with that end state in focus and the rules, specifications and constraints that govern the manner in which the task can be successfully accomplished (Steiner, 1972).

Steiner's (1992) team task typology is well established in management, industrial/organizational psychology, and organizational behavior and founded on the task at hand and how the task itself imposes requirements on the group to act in a unitary or divisible manner (Barrick et al., 1998; Baer, Oldham, Jacobsohn and Hollingshead 2008; Mohammed and Angell, 2003; Neuman and Wright, 1999). Steiner's typology is relevant (Bell, 2007) because it matches the proposed influence of each individual's contribution to the team's performance with the task type. Furthermore, the typology indicates that team composition is theoretical and important to the study of team performance (LePine, Hollenbeck, Ilgen, and Hedlund, 1997). The typology focuses on two broad categories of group tasks, unitary tasks and divisible tasks, explained in the next section.

Unitary Tasks Unitary tasks are tasks that cannot be divided profitably or efficiently into subtasks and then performed piecemeal by two or more individuals at the same time. With unitary tasks, mutual assistance between team members is not possible and outcomes are reached

by individuals or by the sum of the team's individual efforts. An example would be a soldier in a battle situation. The task of "shooting at the enemy" involves several identifiable subtasks (steadying the weapon, sighting a target, taking aim and pulling the trigger) but only an individual team member can efficiently and effectively complete the entire task. There are four types of unitary task that differ in the degree to which the individual member performance that determined group performance.

When a unitary task is *disjunctive*, the group is permitted to assign total weight to the contribution of any one member, but not among or across members. The task in its entirety will be assigned to the member who can perform it most effectively (Barrick et al., 1998). In terms of performance, the task and its outcome will be equal to the best or maximum performance by a single team member. (Devine, 2002) and the group will be represented by the performance of its single most capable member on that task (Kickcul and Neuman, 1990). An example would be of a team quiz show where two teams of college students compete against each other. When a question is raised, the first person from all the players to answer correctly wins for their team. Any team member might have answered, but by rule only one actually does without any consultation or assistance from her teammates. When a unitary task is *conjunctive*, the team is forced by constraints to use only the performance of the least productive member. In terms of performance, the task and its outcome would be equal to the worst (slowest, weakest, lowest) or minimum performance of a single team member (Barrick et al., 1998). The lack of redundancy suggests that if a member fails, no other team members will be able to compensate (LePine, Hollenbeck, Ilgen, and Hedlund, 1997) and requires that all members perform at a minimally acceptable level (Halfhill, Nielsen, Sundstrom and Weilbaecher, 2005). An example of a conjunctive unitary task would be a team of mountain climbers ascending an icy and treacherous

mountainside. The climbers are hooked together by a nylon safety rope and can only ascend as fast as the slowest member. This situation is often refereed to as "the weakest link in the chain".

When a unitary task is *additive*, the group weighs each individuals' contribution equally and all of the contribution are summed. In terms of performance, the task and its outcome will be equal to the summed performance of every individual on the team without exception (Baer, Oldham, Jacobsohn and Hollingshead 2008). An example of an additive task would be a tug-of war where every member of the team pulls simultaneously and in the exact same direction with no loss from incorrect process. The force would be equal to the sum of all of the team members. Thus while a team member's performance can be offset by a stronger or weaker members performance, each team members performance is counted towards the task completion. Depending on the actual task measured, this could be reflected in the total additive level of the team, i.e. each members score added into an aggregated team score, or through the mean (Barrick et al., 1998).

Divisible Tasks Unlike unitary tasks, divisible tasks occur when work assignments can be broken into subtasks and performed by two or more team members. The group may be successful even though no single member of the team could accomplish the entire task on their own. Several significant challenges occur with divisible tasks such as the correct assignment of the subtask to the most appropriate team member, the manner in which two or more team members may work together to perform a shared subtask, and the reconstitution of the subtasks into the whole task upon completion.

Project teams are unique because by their temporary, focused nature, they take on projects containing both unitary and divisible team tasks. Such teams are often multidisciplinary and therefore require teams members to work on individually on unitary tasks within their own

area of expertise successfully for the project objectives to be met. In addition to being multidisciplinary, project teams are also cross-disciplinary and require team members to work across with other disciplines with fellow team members. Therefore, project teams require both individual expertise and the ability to work cross-functionally with other team member through social interactions, such as verbal and written communication.

To better understand teams and differences in team outcomes, the next section will illuminate the importance of diversity.

Team Diversity

To gain competitive advantage, firms are increasing the employee diversity in background, knowledge, and expertise (Horwitz, 2005). Not enough is known about how the differences between individuals comprising a team affect team performance (Barrick et al., 1998). The current research has suggested positive relationships between race/ethnicity and team performance (Guzzo and Dickson, 1996; Baer et al., 2008; Mohammed and Angell, 2004; Harrison and Klein, 2007; Fisher, Bell, Dierdorff and Belohlav, 2012). The underlying assumption is that team diversity increases innovation, creativity and problem solving (Horwitz, 2005) and avoids groupthink (Janis, 1972). However, additional empirical work has indicated negative relationships between age and gender diversity (Tsui and O'Reilly, 1989; Pelled, 1996; Bayazit and Mannix, 2003) and team performance. Thus, if managed correctly, heterogeneity can lead to significant synergy, but if mismanaged diversity can lead to conflict, miscommunication and mistrust (Horwitz, 2005). Based on these findings, team diversity clearly plays a significant role in key team performance outcomes. However, it is important to avoid suggesting that diversity is "good" or bad" without carefully describing both the variable of interest in team

performance as ell as the manner with which diversity was conceptualized (Bell, Villado, Lukasik, Belau, and Briggs, 2011).

At the individual level, diversity refers to any difference between individuals on an attribute that leads to the perception that one individual is different from another on that attribute and consequently can be reflected in a multitude of dimensions (Knippenberg, DeDreu and Homan, 2004). Team diversity is a multi-level construct, assessing individual members and aggregating the differences "up" to the team level. Therefore, team diversity reflects the distribution of those differences among the team members with respect to a common attribute (Harrison and Klein, 2007). Pelled, Eisenhardt, and Xin (1999) further defined team diversity as the extent to which a team or work group is heterogeneous in demographic terms. Diversity is comprised of surface-level and deep-level dimensions (Harrison, Price and Bell, 1998). The frequency of research papers published on both diversity types have grown dramatically in recent years (Harrison and Klein, 2007). Application of diversity research such as this paper should increase the explanatory power of models of work-group diversity (van Knippenberg, De Dreu, and Holman, 2004).

Surface-Level Diversity

Surface-level diversity are defined as overt, biological characteristics that are usually (but not always reflected) in physical features (Harrison, Price and Bell, 1998) and include demography, defined as the aggregated external characteristics of the team such as heterogeneity, tenure and size (Smith, Smith, Olian, Sims, O'Bannon and Scully, 1994) and immutable and easily distinguished and agreed-upon individual features such as age, gender, marital status and race/ethnicity of team members, but also relationships with the organizational such as tenure and functional area (Pelled, Eisenhardt, and Xin, 1999). Demographic factors are important and

frequently scrutinized causal variables for both team practices and through them, organizational performance (Pfeffer, 1983). Demographic diversity has become one of the foremost topics for both managers and management researchers (Pelled, Eisenhardt, and Xin, 1999). In part due to the ease of measurement, demographic diversity has been frequently studied (Harrison, Price and Bell, 1998) leading to mixed or non-findings (van Knippenberg, De Dreu, and Holman, 2004; van Knippenberg and Schippers, 2007).

Deep-Level Diversity

Deep-level diversity includes differences among members that can only be learned through extended interaction and observation of the individuals' verbal and non-verbal behavior in the group (Harrison, Price and Bell, 1998). Deep-level attributes are based on psychological features and include values (Jehn, Chadwick, and Thatcher, 1997), personality (Barsade, Ward, Turner, and Sonnenfeld, 2000), and attitude, beliefs and values (Harrison et al., 1998). A similar notion, diversity in underlying attributes, comprises attitudes, values, knowledge and skills (Jackson, May, and Whitney, 1995). Because of the great difficulty measuring these elements in multiple individuals across multiple teams, fewer studies have focused on deep-level diversity such as group personality composition. There needs to be more research on team diversity (Pelled Eisenhardt, and Xin, 1999).

While demographic diversity is important, several researchers have suggested that deep-level diversity may have a stronger effect on team performance (Bell, 2007; Harrison et al., 2002; Hollenbeck et al., 2003). Therefore this research will focus on group personality composition as a deep-level diversity constituent and will delineate team diversity as the distribution of psychological dimensions among team members in regard to the personality traits conscientiousness, extraversion, emotional stability, openness to experience and agreeableness.

The next section discusses personality at the individual level, introduces the Five-factor Model, and briefly describes the traits and some of their facets.

Personality

As discussed in Chapter 1, traits are descriptive frameworks that serve a structural purpose by giving conceptual order to an otherwise complex psychological phenomenon (Dumont, 2010). Personality traits are fundamental and exist in all cultures (Galton, 1949) and can be found in the natural language of all human groups, a concept termed the "fundamental lexical hypothesis (Goldberg, 1990). The traits are stable and consistent over time and situations, and each trait predisposes the individual to behave in a certain way (Robertson and Callinan, 1998). Personality research has passed through several stages in its development, resulting in a narrowed structure of the personality construct. Allport and Odbert (1936) created a comprehensive idiographic and descriptive catalogue of human traits. The authors and their student research team reviewed the Webster's unabridged New International Dictionary in the English language and although admittedly incomplete, the list included 17,953 terms descriptive of personality or personality behavior. Allport put forth that personality traits and disposition are inferred as the repeated occurrences of acts under similar significant individual situations and such traits are necessary to better understanding human behavior. Repeated behavior would be an outcome of consistent personality traits under similar circumstances over time. In Allport's vocabulary, cardinal traits are singular "master qualities" that are pervasive, influential, and strongly affect the individual's self-image, life goals and both public and private behavior. Furthermore, most individuals also have five to ten central traits that give richness and balance to

the person beyond their cardinal trait. Lastly, secondary traits are specific and detailed dispositions that might occur frequently in an individual in given situations or circumstances.

A decade later Cattell began with 4500 personality descriptors and used a succession of cluster analysis procedures producing 35 clusters (Cattell, 1943). Following further data collection, factor analysis, and refinement sixteen source traits (16PF) were produced. Source traits are "structural influences" underlying personality factors and result in surface traits, the observable cluster of variables. Also the work had administrative errors which were later discovered, Cattell (1950) presented correlations that produced five higher-order factors named "Global factor scale descriptors.

For some time, there were several personality models with five factors, but the factors were either substantially different or similar but given different labels (John, 1989).

The Five Factor Model of personality traits evolved over much of the twentieth century. From Thurston (1934) through Fiske (1949), Tupes and Christal, 1921[1961]), and Cattell (1965), different terminology has been used by various researchers to describe similar personality dispositions (Dumont, 2010). Costa and McCrae put together neuroticism, extraversion and openness derived from a cluster analysis (Costa and McCrae, 1976) and later added conscientiousness and agreeableness in 1983 (Pervin and John, 1999). Since the early 1990's, personality is commonly defined by five broad buckets of traits: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness (Costa and McCrae, 1992). These have been frequently applied in management (Zhao, Seibert and Lumpkin, 2010; Organ, 1994), leadership (Judge and Bono, 2000; Judge, Bono, Ilies, and Gerhardt, 2002), industrial/organizational psychology (Tett, Jackson, and Rothstein, 1991; Hurtz and Donovan, 2000; Judge, Heller, and Mount, 2002), international management (Salgado, 1997; Huang, Chi,

and Lawler, 2005) and human resource management (Boudreau and Boswell, 2001; Marcus, Lee, and Ashton, 2007; Powell, Goffin, and Gellatly, 2011; Tews, Stafford, and Tracey, 2011).

While the model does not account for the full scope of personality (Mershon and Gorsuch, 1988), the FFM identifies the basic dimensions of personality (Costa and McCrae, 1992) and represents the highest hierarchical order of trait description (McCrae and John, 1981). Furthermore, all five factors display discriminant and divergent validity (McCrae and John, 1981) and endure for decades in adults (McCrae and Costa, 1990). The five-factor model is the "latitude and longitude along which any new personality construct should be mapped" (Ozer and Reise, 1994; Goldberg, 1991; Funder, 2001). The FFM as put forth by Costa and McCrae (1992) is now broadly accepted and is the "currency" for personality trait research (Funder, 2001). The five traits are next defined and briefly discussed in detail.

Extraversion (also called surgency) includes variables such as social, fun-loving, affectionate, friendly and talkative (McCrae and Costa, 1987). Six facets identified in extraversion and used in scales to measure it (Revised NEO-PI Costa, McCrae, and Busch, 1986) are warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotions. Trait adjectives used to describe extraversion include active, assertive, energetic, enthusiastic, outgoing, and talkative (John, 1989). Extraversion is positively associated with individual performance outcomes, such as sales occupations (Barrick and Mount, 1991).

Conscientiousness describes adherence to socially prescribed rules and norms for impulse control, in being task- and goal-directed, and in being able to delay gratification (John and Srivastava, 1999) and discriminates between individuals who are orderly, industrious, and planful and those who are undisciplined, lazy, and unreliable (Hampson, 2012). Conscientiousness correlates positively to both health and job performance (Ozer and Benet-

Martınez 2006). Six facets identified in conscientiousness and used in scales to measure it (Revised NEO-PI Costa, McCrae and Busch, 1986) are competence, order, dutifulness, achievement striving and deliberation. Trait adjectives used to describe conscientiousness include efficient, organized, plan-driven, reliable, responsible, and thorough (John, 1989).

Agreeableness is associated with kindness, unselfishness, generosity, and fairness (Goldberg, 1992) and agreeable people strive more for cooperation rather than competition (Costa and McCrae, 1992). Six facets identified in agreeableness and used in scales to measure it (Revised NEO-PI Costa, McCrae and Busch, 1986) are trust, straightforwardness, altruism, compliance, modesty and tender-mindedness. Trait adjectives used to describe agreeableness include forgiving, not demanding, warm, not stubborn, not show-off, and sympathetic (John, 1989).

Openness is one of the more recent broad personality traits identified (Costa and McCrae, 1983), the most difficult to identify and interpret (Barrick and Mount, 1991) and often difficult to grasp (McCrae, R. and Sutin, A., 2009). The trait is seen in "the breadth, depth, and permeability of consciousness" (McCrae, 1997). Six facets identified in openness and used in scales to measure it (Revised NEO-PI Costa, McCrae and Busch, 1986) are fantasy, aesthetics, feelings, actions, ideas, and values. Adjectives used to describe the openness trait include artistic, curious, imaginative, insightful, original, and wide interests (John, 1989).

Neuroticism is the chronic tendency an individuals to experience more negative thoughts and feelings than others, to be emotionally unstable, and to be insecure (Hampson, 2012). Six facets identified in neuroticism and used in scales to measure it (Revised NEO-PI Costa, McCrae and Busch, 1986) are anxiety, hostility, depression, self-consciousness, impulsiveness and vulnerability. Adjectives used to describe the neuroticism trait include anxious, self-pitying,

tense, touchy, unstable, and worrying (John, 1989). In recent years, neuroticism has been reverse-coded and termed emotional stability, so that all five factors would be viewed as a positive personality trait in most situations within the American culture (Digman, 1997). Higher levels of neuroticism are associated with less satisfying relationships (Roberts, Kuncel, Shiner, Caspi, and Goldberg, 2007).

Group Personality Composition Research

As summarized in Table 2.1, group personality research to date has been a multi-disciplinary effort across management, industrial-organizational psychology, and social psychology spanning the last fifteen years[1]. Although GPC research has grown slowly (Humphrey, Hollenbeck, Meyer, and Ilgen, 2011), the papers discussed below each represent at least a small piece of our accumulated knowledge in this area.

In group personality composition research, the research setting is a significant discriminator between GPC and team performance studies, and thus the literature fits into three different sets: lab experiments, field studies, and the subsequent literature review and meta-analyses. Lab experiments are generally defined as short-term in-class tasks where student teams work together briefly on a task with little or no personal risk/rewards outcomes (Halfhill et al., 2005; Bell, 2007). Examples would include students stacking building blocks (Graziano, Hair, and Finch, 1997) or constructing newspaper bridges (Kichuk and Wiesner, 1997), both observed during a single class meeting. Conversely, field studies involve teams working interdependently over a significant period of time with an outcome that represents a significant risk/reward.

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[1] Quigley and Gardner (2007) is omitted from this summary because while the paper investigates group personality,

Examples might be an intense sixty-hour week for students designing a working competitive robot for a critical engineering grade (Peeters, Rutte, Tuijl, and Reymen, 2008) or the performance of existing Army National Guard units (Halfhill, Nielsen, Sundstrom, and Weilbaecher, 2005). Furthermore, while relationships between GPC and team performance have been reported in field study research, there was generally no such effect identified in the lab experiments (Bell, 2007). Similarly, Halfhill et al. (2005) report that in field study settings, research papers indicate a significant relationship in 40% of the papers, but a relationship is only reflected in 12% of the lab experiment research projects. Informed by these findings, this literature review will separate the empirical work into lab experiment papers and field studies. The remaining papers consist of an integrative literature review three distinct meta-analyses between 2005 and 2009. These papers will be discussed at the end of this section.

However, it is important to first explain the context for the emergence of GPC research. Significant interest began in the 1990's following the meta-analytical research presented by Barrick and Mount (1991). The authors suggested that individual conscientiousness was predicative of performance (job proficiency, training proficiency, and personnel data) across five separate occupations (professionals, police, managers, sales and skilled/semi-skilled). Additionally, the research indicated a relationship between extraversion and occupations involving social interaction, specifically managers and sales. Lastly, openness and extraversion were significant predictors of training proficiency across all five occupations investigated. The article, published in Personnel Psychology, was influential with researchers across multiple disciplines in business and psychology. The next logical step was to consider the consequences of combinations of personalities in teams and its effect on team performance. The first GPC research projects were published in 1997.

In the Beginning: Lab Experiments in GPC Research Early GPC research utilized lab experiments to test hypotheses investigating relationships between group composition and team performance. Four of the first five major GPC papers published in peer-reviewed journals were set in lab experiments.

In the first such experiment, Barry and Stewart (1997)[2] investigated how team member personality characteristics related to group processes and work team performance through the use of experiments with 298 graduate students in 61 teams. Their dependent variable was an instructor's average rating of the team's quality across a series of three creative problem-solving tasks. Although not hypothesized, there were no relationships indicated between team performance and agreeableness, emotional stability, or openness to experience. Surprisingly, the research found no relationship between conscientiousness and team performance, but did suggest a curvilinear relationship between higher levels of team extraversion and team performance, with the best performance reflected in groups where 20-40% of the team members rated high in the trait. A later research attempt to replicate this finding was unsuccessful (Barrick et al., 1998), and further research would reflect a strong relationship between conscientiousness and performance (Neuman et al., 1999; and Halfhill et al., 2005). One possible explanation lies in Barry and Stewart's choice of proportion to operationalize both group personality traits. The authors used a *T* scores to standardize the trait levels (M=50, SD=10) and then regarded any scores above 55 to be "relatively conscientious" or "relatively extraverted" in that trait. Later research would primarily operationalize team-level traits using either mean, minimum or variance measurements and reflect significant relations. More recently, the proportion

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[2] The authors presented an early version of this research at the Academy of Management in 1995 and later successfully submitted the full paper to the *Journal of Applied Psychology*. This is an excellent example of the early and continuing multi-disciplinary nature of group personality composition research.

operationalization has been criticized for inaccurately stretching the GPC trait range (Peeters et al., 2006

Concurrently, Graziano, Hair, and Finch (1997) looked more narrowly at whether team agreeableness is negatively related to team performance when mediated by competitiveness. Their respondents were 39 teams of three undergraduate students each totaling 117 participants, and the measured dependent variable was the total number of blocks used in building a tower over twelve attempts. Their findings did indicate a relationship, albeit a small one, between team agreeableness and performance when mediated by perceptions of competiveness.

Kichuk and Wiesner investigated all five group personality traits in product design teams. 99 teams totaling 419 undergraduate engineering students were observed building newspaper bridges in a 45-minute lab experiment. Team performance was measured in scores calculated on time taken, dimensions and weight the bridge would hold. Only teams that successfully built a bridge were included in the 99 teams, disallowing 17 teams that "failed" the task. Variance in conscientiousness was found to be negatively and significantly related to performance. There were no correlations found between team performance and the other four GPC traits.

Waung and Brice (1998) considered whether the chance to caucus and discuss the assigned task in detail affected team performance for a group of highly conscientious members. (The task involved generating possible uses for a named object, e.g. spatula.) The respondents were 40 teams totaling 121 undergraduate students of either all "high" or all "low" conscientiousness, defined as the top and bottom tertile in conscientiousness, with the middle tertile dropped from the experiment. With or without the opportunity to caucus, teams higher in consciousness outperformed the teams registering lower in the trait.

Waldman, Atwater and Davidson (2004) looked at the relationship between teams with high individualism, conscientiousness, and agreeableness and performance by leaderless teams. The sample was 32 teams totaling 152 undergraduate students and the dependent variable for performance was an assessment by two raters on unstructured solutions to case study. The authors calculated a *z* score for each student on each trait and then labeled a student "high" on that trait where $z>.5$. They then calculated the proportion of "high" students on each team for the chosen two group personality traits. Neither conscientiousness nor agreeableness scores reflected a relationship to performance. This is notable, because following the same non-findings between conscientiousness and performance using a proportion operationalization, it is suggested that the proportion method or "high or not" or "high or low" lacks the specificity to investigate the nuances in the relationship between GPC and team performance.

These lab experiments mostly returned mixed findings or non-findings. The research setting led to brief singular in-class tasks (Peeters, Rutte, Tuijl, and Reymen, 2006). Furthermore, the team may not have had a full opportunity to work and connect as a team, or as defined in Chapter 1, to become sets of individuals who interact interdependently to achieve a common objective (Baker and Salas, 1996; Bell, 2007). The next section discusses the change from lab experiments to field studies in group personality composition research

Evolution and Agreement: Field Studies in GPC Research Not surprisingly, as researchers accumulated more understanding of group personality composition and team performance, more studies began to ambitiously use field studies to collect data. More recently, research has indicated the increased use of field studies to collect data.

In a seminal turning point for GPC studies, Barrick, Stewart, Neubert and Mount (1998) examined the correlation between all five GPC traits and team performance when mediated by social cohesion. Collecting data from 51 existing work teams averaging roughly 13 employees

per team, team performance was measured as the sum of supervisor ratings of several dimensions of team effectiveness with a coefficient alpha of .83 for this scale. The findings suggest that mean scores on conscientiousness, agreeableness, and emotional stability all have a significant and positive relationship with team performance. The authors also found support for correlation between team performance team minimum scores for conscientiousness, agreeableness, extraversion, as well as a negative relationship between performance and team variance in conscientiousness. (As already noted, there was no curvilinear relationship reported between extraversion and performance.) Due to the large sample size of actual work teams and the broad survey of all five group personality traits (in addition to general mental ability), the Barrick et al. (1998) paper exemplifies the aspiration of GPC research to study real teams in real work situations.

Using supervisor team ratings and quantity and quality of team assignments over one year to measure team performance, Neuman and Wright (1999) watched 79 four person human resource teams in a large department store chain and found a relationship between team performance and conscientiousness and agreeability. In addition to team performance, agreeableness was correlated with team level interpersonal skills and conscientiousness was related to team level accuracy. Although not hypothesized, there was no relationship found between team performance and group extraversion, emotional stability or openness to experience.

Table 2.1 - Group Personality Composition Literature Review

	Authors	Title	Year	Research Question(s)	Dependent Variable(s)	Research Type and Sample
1	Barry and Stewart	Composition, Process, and Performance in Self-Managed Groups: The Role of Personality	1997	How are member personality characteristics related to group processes and work team performance?	Averaged an instructor's rating of the team's quality across a series of three in-class creative problem-solving tasks.	Lab Experiment 61 teams totaling 298 graduate students
2	Graziano, Hair, and Finch	Competitiveness Mediates the Link Between Personality and Group Performance	1997	Is team agreeableness negatively related to team performance when mediated by competitiveness?	The total number of blocks used in building a tower over 12 in-class attempts was recorded.	Lab Experiment 39 teams of 3 undergraduate students each totaling 117 participants
3	Kichuk and Wiesner	The Big Five personality factors and team performance: implications for selecting successful product design teams	1997	Is group personality composition a predictor for product design team success?	Teams built newspaper bridges in class. Scores were calculated on time taken, dimensions and weight the bridge would hold.	Lab Experiment 99 teams totaling 419 undergraduate engineering students.
4	Barrick, Stewart, Neubert and Mount	Relating Member Ability and Personality to Work-Team Processes and Team Effectiveness	1998	Are ability and all five GPC traits related to team performance when mediated by social cohesion?	The sum of supervisor ratings of eight dimensions of team effectiveness	Field Study 51 work teams totaling 651 employees.
5	Waung and Brice	The Effect as of Conscientiousness and Opportunity to Caucus on Group Performance	1998	Does the chance to caucus affect team performance for a group of highly conscientious members?	The number of alternate uses for a uniform object in a five-minute span, with or without a five-minute pre-task discussion.	Lab Experiment 40 teams totaling 121 undergraduate students of either all "high" or all "low" conscientiousness
6	Neuman and Wright	Team Effectiveness: Beyond Skills and Cognitive Ability	1999	Do individual and group level personality, *g,* and job-specific skills predict performance?	Supervisor team ratings and quantity and quality of team assignments over one year.	Field Study 79 four person human resource teams

Table 2.1 - Group Personality Composition Literature Review (Continued)

7	Neuman, Wagner, and Christiansen	The Relationship Between Work-Team Personality Composition and The Job Performance of Teams	1999	What is the relationship between GPC and work team performance when GPC is operationalized as either trait mean (team personality elevation TPE) or team trait variance (team personality diversity TPD)?	Customer complaints per month per team and a supervisor evaluation of the team	Field Study 82 teams totaling 249 retail assistants
8	Mohammed and Angell	Personality Heterogeneity in Teams: Which Differences Make a Difference for Team Performance?	2003	When controlling for the trait mean does the trait variability then correlate with performance?	15-week process improvement project with external clients, high stress, accountability, and risk/reward outcomes.	Field Study 59 undergraduate and graduate student project teams totaling 267 students
9	Waldman, Atwater and Davidson	The Role of Individualism and the Five-Factor Model in the Prediction of Performance in a Leaderless Group Discussion	2004	Does individualism predict additional variance in performance beyond the Five-factor model?	Assessment by two raters on unstructured solution to provided case study.	Lab Experiment 32 teams totaling 152 undergraduate students
10	Mohammed and Angell	Surface- and deep- level diversity in work groups: examining the moderating effects of team orientation and team process on relationship conflict	2004	What is the differential impact of surface-level diversity (gender, ethnicity), deep-level diversity (time urgency, extraversion), and two moderating variables (team orientation, team process) on relationship conflict overtime?	An in-class process improvement project with external clients, stress, accountability, and risk/reward outcomes.	Field Experiment 45 student project teams totaling 206 students/
11	Halfhill, Nielsen, Sundstrom, and Weilbaecher	Group Personality Composition and Performance in Military Service Teams	2005	Does personality composition of military service teams correlate with group performance?	The computed average performance rating of each individual on the team.	Field Study 47 intact active military teams totaling 422 Air National Guard personnel

Table 2.1 - Group Personality Composition Literature Review (Continued)

12	Halfhill, Sundstrom, Lahner, Calderone, and Nielson	Group Personality Composition and Group Effectiveness	2005	(a) How have researchers operationalized GPC? (b) What criteria have been used as measures of group effectiveness? (c) Is GPC related to group effectiveness? (d) Under what conditions is GPC associated with group effectiveness?	Integrative literature review	31 studies containing 334 predictor - criteria relationships
13	Peeters, Rutte, Tuijl, and Reymen	Personality and Team Performance: A Meta-Analysis	2006	The relationship between GPC (trait elevation and variability) and team performance were researched. Moderation by type of team was tested for professional teams versus student teams.	Meta-Analysis	6 - 9 studies with 392 to 527 teams
14	Bell	Deep-Level Composition Variables as Predictors of Team Performance: A Meta-Analysis	2007	Which operationalizations best measure which of the five GPC traits?	Meta-Analysis	89 academic papers, 225 to 425 correlations
15	Baer, Oldham, Jacobsohn, and Hollingshead	The Personality Composition of Teams and Creativity: The Moderating Role of Team Creative Confidence	2008	Is team creativity confidence a moderator between group personality composition (extroversion, openness, emotional stability, agreeableness) and team creativity?	Rater assessments of team creativity	Lab Experiment 147 teams totaling 435 students
16	Peeters, Rutte, Tuijl, and Reymen	Designing in Groups: Does Personality Matter?	2008	Using Hackman's (1987) input-process-output model, does GPC affect innovation behavior and design performance?	Project class grade and team member ratings.	Field Study 26 teams totaling 128 students
17	Halfhill, Nielson, and Sundstrom	The ASA Framework A Field Study of Group Personality Composition and Group Performance in Military Action Teams	2008	Using Schneider's Attraction-Selection-Attrition (ASA) theoretical framework, does personality composition of military service teams correlate with group performance?	Superior's team evaluation	Field Study 31 teams of 166 Army National Guard troops

Table 2.1 - Group Personality Composition Literature Review (Continued)

18	Prewett, Walvoord, Stilson, Rossi, and Brannick	The Team Personality – Team Performance Relationship Revisited: The Impact of Criterion Choice, Pattern of Workflow, and Method of Aggregation	2009	Do different team personality traits affect team performance and if so, how.	Meta-Analysis	70 studies, 1636 to 2510 correlations
19	Humphrey, Hollenbeck, Meyer, and Ilgen	Personality Configurations in Self-Managed Teams: A Natural Experiment on the Effects of Maximizing and Minimizing Variance in Traits	2011	Does seeding teams to create maximal and minimal levels of extroversion and conscientiousness variance affect short-term and/or long-term performance?	Team effectiveness, short-term and long-term performance based time for task completion	Field Studies 77 teams totaling 288 MBA students
20	O'Neill and Allen	Personality and the Predication of Team Performance	2011	Is any one FFM trait particularly predictive of team performance?	Composite rating on a complex design project over 6.5 months	Field Study 129 undergraduate engineering teams totaling 564 students

Neuman, Wagner, and Christiansen (1999) observed 82 teams totaling 249 retail assistants in different product category departments within a large retail chain. This landmark paper is the first to devise its research questions and plan around the four different primary operationalizations of each group personality trait. The authors retitled variance to *team personality diversity (TPD)* and mean to *team personality elevation (TPE).* All five group personality traits were significant and positive for either TPE or TPD. Variance (TPD) and team performance were correlated in the extraversion and emotional stability. Additionally, mean (TPE) and team performance were significantly related in agreeableness, conscientiousness, and openness to experience. The authors noted surprise that variance in emotional stability should be positively related to team performance which was not predicted. A possible explanation put forth is that in high performance teams, a member with low emotional stability (neurotic) can be countered by a teammate with high emotional stability and balance out the effect. Neuman, Wagner, Christiansen (1999) also reported significant R^2 for each GPC trait: agreeableness (.29), conscientiousness (.17), extraversion (.09), emotional stability (.08) and openness to experience (.10). Together, all five GPC traits explained 29% of the differences in team performance in this study.

Mohammed and Angell (2003) observed 59 undergraduate and graduate student project teams totaling 267 students throughout a semester, measuring team performance by the student team grades on written deliverables and oral presentation. Provocatively, the authors dropped openness to experience from their GPC group the trait "is the least clearly defined" and is not "a significant predictor of individual or team performance" (Mohammed and Angell, 2003). The results suggest a negative relationship between performance (defined as an oral presentation score) and variability on the socially oriented traits agreeableness, extraversion and neuroticism,

as well as a negative effect from mean agreeableness. Mean conscientiousness and extraversion were related to success on the written presentation. The authors suggest that their study indicates the importance of avoiding focusing GPC research on trait means and homogeneity, but to investigate heterogeneity as well. That said, a weakness of this study is the authors' use of standard deviation to measure heterogeneity rather than the more broadly accepted variance measure (Peeters et al., 2006), making comparisons with other research findings more difficult. In a related study, Mohammed and Angell (2004) investigated extraversion as a deep-level diversity trait, but variance in the trait suggested no correlation with team performance.

In a novel field experiment, Halfhill, Nielsen, Sundstrom, and Weilbaecher (2005) observed 47 intact active military teams totaling 422 Air National Guard personnel. Because of the difficulties of researching existing teams in their "workplace", their dependent variable was the aggregation of superior's performance rating for each individual on the team. They found that team performance correlated positively with mean and minimum team conscientiousness, but not variance on that trait. Moreover, the research indicated a further positive relationship between performance and mean and minimum agreeableness, and a negative relationship between variance in the trait and performance. The suggested association between minimums on both traits and performance may indicate a "least common denominator effect", where the weakest member in that trait on the team may determine the team's relative success or failure.

Peeters, Rutte, Tuijl, and Reymen (2008) measured the project class grade and team member ratings of 26 teams totaling 128 students. Their results reiterated that mean conscientiousness is positively related to team performance, but there was no such relationship with mean agreeableness. Although the team project (building a working robot in a competitive environment for course credit) was intense and met the criteria for a team, the entire project was

competed in a week and may have lacked the opportunity to fully develop as an interdependent team and weakened the GPC effect.

Halfhill, Nielson, and Sundstrom (2008) again studied Army National Guard troops (31 teams of 166 soldiers) and used the team's immediate superior's evaluation as the performance variable. The authors found positive relationships between team performance and both mean and minimum agreeableness, and with minimum conscientiousness. Variance in group conscientiousness was negatively and significantly related to team performance.

Humphrey, Hollenbeck, Meyer, and Ilgen (2011) created teams artificially "seeded" with maximal and minimal levels of extroversion and conscientiousness variance to observe the affect on short-term and long-term performance with 77 teams totaling 288 MBA students over an entire academic year. Specifically, the researchers sought to increase team performance by maximizing extroversion variance and minimizing conscientiousness variance. Although the seeding failed and did not affect team performance, the authors also hypothesized an interaction effect between high extraversion and low conscientiousness variances that would increase team performance. This hypothesis was fully supported by the results and heightened interest in going beyond direct effects to interaction affects in group personality composition research.

O'Neill and Allen (2011) investigated the group conscientiousness trait and found that mean (variance was negative as predicted, but not significant) conscientiousness predicted team performance, while agreeableness, extraversion and emotional stability did not. Both mean and minimum openness were negatively and significantly related to team performance, a finding not seen elsewhere in the empirical studies.

These field studies advanced group personality composition research through the study of genuine teams under the tangible conditions of stress, time pressures, frequent human interaction

and actual risk/reward consequences. In the next section, the solidifying integrative literature review and meta-analyses will be discussed, followed by the shortcomings of both the lab experiment and fields studies research that this paper will address.

Bringing It All Together: Review and Meta-Analyses in GPC Research By the mid-2000's, the literature was at a temporal junction for the coalescing effect and purposeful redirection of review and meta-analysis. Thus, it is not surprising that four such papers were published in peer review journals between 2005 and 2009.

In 2005, Halfhill et al. undertook a significant integrative literature review of the GPC domain, studying 31 studies containing 334 significant predictor-criteria relationships. Of those significant relationships, the mean operationalizations of GPC accounted for over half of the observed relationships, variance for 21%, and minimum 14%. The strongest average correlations in the 31 projects were produced by the mean, minimum, and variance operationalizations. The average variance was negative, explained by the suggested negative relationships between performance and variance in conscientiousness, agreeableness and emotional stability in the articles reviewed thus far in this paper. This underscores the possibility that in some cases, team heterogeneity can diminish team performance. One very important finding is that group personality composition reflects statistical significance much more often in field settings than laboratory settings. The paper also indicates that minimum and mean scores are equally valid performance predictors. Lastly, GPC as a whole is equally predictive of performance in task- and relationship-oriented activities.

In a broad 2007 meta-analysis, Bell reviewed 89 academic papers containing 225 to 425 independent correlations and found positive relationships between team performance and conscientiousness, agreeableness, extraversion, and openness to experience in field settings, but found no support for any of these traits and performance in lab settings. The author found no

relationship between team outcomes and emotional stability in either setting. While not the only valid predictor operationalizations, Bell found that agreeableness is strongest when calculated as a minimum. Conscientiousness, extraversion and openness are strongest when calculated as means. Emotional stability was strongest when calculated as a mean, however the effect was still not statistically significant.

In a 2006 meta-analysis, Peeters, Rutte, Tuijl, and Reymen confirmed the positive relationship between mean conscientiousness and agreeableness as well as the negative relationship between variance in conscientiousness. In a useful test, the authors found that professional teams and student teams had the same relationship between team performance and mean (positive) and variance (negative) in both agreeableness and conscientiousness. This finding diminishes the argument against using student teams in GPC research. However, student teams differed in effect from professional teams for both openness to experience and emotional stability.

Lastly, Prewett, Walvoord, Stilson, Rossi, and Brannick undertook another meta-analysis in 2009, analyzing 1636 to 2510 correlations from 70 studies. Specifically, the authors hypothesized that conscientiousness, agreeableness, and emotional stability would be supplemental traits, where the more of the trait in the aggregate team, the better team performance. A positive correlation using mean and minimum operationalizations and a negative relationship using variance are the best measurements of the overall level of a trait on a team, and were this used to test the hypotheses. Conscientiousness as a supplemental trait was partially supported with a positive minimum and mean correlation, but variance reflected a non-significant and negative relationship. Agreeableness was fully supported as a supplemental trait, with positive mean and minimum correlations and a negative variance correlation with

performance. Emotional stability was not supported as a supplemental trait and displayed positive correlations only with the mean and the maximum. Extraversion was hypothesized as a complimentary trait, where variance would be positively related to performance, and minimum would be negatively related to performance. The results were mixed, as variance had a positive relationship with performance, however while negatively correlated as predicted, the score for mean did not reach statistical significance. Following Mohammed and Angell (2003), the authors did not account for openness to experience as they deemed that its "theoretical approaches" to the trait were significantly different than the other four major traits.

The review and meta-analytical studies illuminated our collective knowledge about group personality composition and also helped identify gaps and shortcoming revealed in the next section.

Shortcomings of Current Group Personality Composition Research

Despite of a significant amount of activity, existing research regarding the relationship between GPC and performance are inconclusive (Mohammed and Angell, 2003). There are four significant and influential problems with the GPC research. First is the use of lab experiments relying on study subjects performing tasks in short time frames with little or no personal risk or reward represented in the outcomes (Halfhill et al., 2005). As discussed, two separate meta-analyses and an integrative literature review strongly indicate that correlations between GPC traits and team performance are significantly lower or even non-existent when the chosen research setting is a laboratory experiment. Second, the use of weak subjective measures as dependent variables is rampant within group personality composition research, such as course or assignment grades being given to students by a single instructor or graduate assistant or multiple

raters of the same ilk with mediocre inter-rater reliability measures (Peeters, Rutte, Tuijl, and Reymen, 2006). Third, compounding the weaknesses inherent in the two previous concerns, the sample sizes in previous group personality have averaged only 46, with a maximum of 100 teams and a low of four teams studied, and therefore often lacked the statistical power necessary to draw granular conclusions from the research results (Halfhill et al., 2005). Fourth, most group personality composition research has viewed all groups as a single uniform entity without texture or nuance, while Hackman (1990) introduced at least seven different team types affecting team outcomes, including project teams (Halfhill et al., 2005). The present research seeks to resolve the current shortcomings and alleviate the significant concerns described above.

The next section will describe the major group personality traits, the operationalizations that researchers have used to observe them, and the results in each trait area. Each trait description is followed by hypotheses applicable to project teams (Sundstrom, de Meuse, and Futrell, 1990) that are performing both unitary tasks and divisible tasks (Steiner, 1972).

Group Personality Traits and Hypotheses

Group personality composition is operationalized through four different approaches of statistical measurement: team mean, team maximum, team minimum, or the team variance. In the case of mean and variance, the individual members scores are aggregated upwards to create a team score. In the case of both team minimum and maximum, the team member with the lowest (minimum) or highest (maximum) score would be used as the team score for that trait.

This section will review the literature's research findings by group personality composition trait. The findings are summarized in Table 2.2. While four of the following hypotheses explore homogeneous GPC in teams, three hypotheses heed calls for additional

investigation of group personality heterogeneity (Waung and Brice, 1998; Mohammed and Angell, 2003). The final three hypotheses answer the appeal for more research on GPC trait interaction affects (Halfhill et al., 2005; Humphrey, Hollenbeck, Meyer, and Ilgen, 2011).

Team Conscientiousness

Conscientiousness has been a popular group personality variable in team diversity research. Although the relationship is frequently hypothesized, the results in testing the relationship between any operationalization of conscientiousness and team performance are mixed. For instance, Barry and Stewart found no correlation between the trait mean at the group level and performance, as did Kichuk and Wiesner (1997). However, more recent research has indicated that positive and significant correlation exists between conscientiousness and performance when the trait is operationalized as the team's minimum measured score (Barrick et al., 1998; Neuman and Wright, 1999; Halfhill et al., 2005; Halfhill, Nielson, et al. 2008; and O'Neill and Allen, 2011. Furthermore, in their comprehensive meta-analysis, Prewett et al. (2009) also found a positive relationship between both mean minimum conscientiousness and team performance.

Conscientiousness is a trait that includes task focus and goal oriented behavior (John and Srivastava, 1999) and would be expected to significantly improve unitary task completion in the project team. The higher level of conscientiousness seen across all team members should then lead to better performance of all the team's unitary tasks. Although Bell (2007) disagrees, Halfhill et al. (2005) state that mean and minimum team scores are equally good predictors of team performance.

Therefore, we would expect to observe the following:

H_1: In project teams, minimum team conscientiousness is associated with team performance such that higher (lower) levels of minimum team conscientiousness are associated with higher (lower) levels of team performance.

The variance in team conscientiousness has also been frequently hypothesized, but with even less agreement in research results than the projects using the minimum operationalization. For instance, while Neuman, Wagner, and Christiansen (1999), Halfhill et al. (2005), Prewett et al. (2009), and O'Neill and Allen (2011) did not discover significant results between variance in conscientiousness and team performance, Kichuk and Wiesner (1997), Barrick et al. (1998) and Halfhill, Nielson, et al. (2008) found significant and negative relationships between a team's variance score on this trait and its performance. All three papers offered that differing levels of conscientiousness in team members might likely lead to conflict and decreased team performance. As project teams must tackle shared divisible tasks as well, variance in conscientiousness would hinder that shared work as more conscientiousness team members and less conscientiousness team members would interact less effectively, also possibly leading to conflict and lowered team performance.

Therefore

H_2: In project teams, variance in team conscientiousness is associated with team performance such that higher (lower) levels of variance in team conscientiousness are associated with lower (higher) levels of team performance.

Table 2.2 - Previous Research Operationalization of Group Personality Composition with Effects on Team Performance
(+) indicates positively correlated with performance, (-) indicates negatively related with team performance , NF indicates tested but No Findings)

Group Personality Trait / Operationalization	Mean	Variance	Minimum	Maximum	Proportion
Conscientiousness	+ (Barrick et al., 1998) + (Neuman et al., 1999) + (Lonergan et al., 2000) + (Halfhill et al., 2005) + (Mohammed and Angell, 2003) + (Bell, 2007) + (Peeters et al., 2008) + (Prewett et al., 2009) + (O'Neill and Allen, 2011) NF (Kichuk and Wiesner, 1997) NF (Halfhill et al., 2008)	- (Kichuk and Wiesner, 1997) - (Barrick et al. 1998) - (Halfhill, Nielson, and Sundstrom, 2008) NF (Halfhill et al., 2005) NF (Neuman et al., 1999) NF (Prewett et al., 2009) NF (O'Neill and Allen, 2011)	+ (Barrick et al., 1998) + (Neuman and Wright, 1999) + (Halfhill et al., 2005) + (Halfhill et al., 2008) + (Prewett et al., 2009) + (O'Neill and Allen, 2011)	+ (O'Neill and Allen, 2011) + (O'Neill and Allen, 2011)	+ (Waung and Brice, 1998) NF (Barry and Stewart, 1997)
Agreeableness	+ (Barrick et al., 1998) + (Neuman et al., 1999) + (Halfhill et al., 2005) + (Halfhill et al., 2008) + (Prewett et al., 2009) - (Mohammed and Angell, 2003) NF (Kichuk and Wiesner, 1997) NF (O'Neill and Allen, 2011)	- (Halfhill et al., 2005) - (Mohammed and Angell, 2003) - (Prewett et al., 2009) NF (Neuman et al., 1999) NF (O'Neill and Allen, 2011)	+ (Barrick et al., 1998) + (Neuman and Wright, 1999) + (Halfhill et al., 2005) + (Bell, 2007) + (Halfhill et al., 2008) + (Prewett et al., 2009) NF (O'Neill and Allen, 2011)	NF (O'Neill and Allen, 2011)	+ Graziano et al., 1997 NF (Waldman et al., 2004) NF (O'Neill and Allen, 2011)

Table 2.2 - Previous Research Operationalization of Group Personality Composition with Effects on Team Performance (Continued) *+ indicates positively correlated with performance, - indicates negatively related with team performance , NF indicates tested but No Findings)*

Group Group Personality Trait / Operationalization	Mean	Variance	Minimum	Maximum	Proportion
Extraversion	+ (Lonergan et al., 2000) + (Bell, 2007) + (Prewett et al., 2009) NF (Kichuk and Wiesner, 1997) NF (Neuman et al., 1999) NF (Mohammed and Angell, 2004) NF (Peeters et al., 2008) NF (O'Neill and Allen, 2011)	+ (Neuman et al., 1999) - (Mohammed and Angell, 2003) + (Prewett et al., 2009) NF (Barrick et al., 1998) NF (Mohammed and Angell, 2004) NF (O'Neill and Allen, 2011)	+ (Barrick et al., 1998) NF (Neuman and Wright, 1999) NF (Prewett et al., 2009) NF (O'Neill and Allen, 2011)	+ (Prewett et al., 2009) NF (O'Neill and Allen, 2011)	+ curvilinear (Barry and Stewart, 1997) NF curvilinear (Barrick et al., 1998) NF (O'Neill and Allen, 2011)
Emotional Stability	+ (Barrick et al., 1998) NF (Kichuk and Wiesner, 1997) NF (Neuman et al., 1999) NF (O'Neill and Allen, 2011)	+ (Neuman et al., 1999) - (Mohammed and Angell, 2003) NF (O'Neill and Allen, 2011)	NF (Barrick et al., 1998) NF (Neuman and Wright, 1999) NF (O'Neill and Allen, 2011)	NF (O'Neill and Allen, 2011)	NF curvilinear (Barrick et al., 1998) NF (O'Neill and Allen, 2011)
Openness to Experience	+ (Neuman, Wagner, and Christiansen, 1999) NF (Kichuk and Wiesner, 1997) - (O'Neill and Allen, 2011)	NF (Neuman et al., 1999)	- (O'Neill and Allen, 2011) NF (Neuman and Wright, 1999)		

Team Extraversion

While most of the previous research associates that there is not a relationship between extraversion using any operationalization of the trait (Kichuk and Wiesner, 1997; Barrick et al., 1998; Neuman and Wright, 1999; Neuman, Wagner, and Christiansen, 1999; Mohammed and Angell, 2004; O'Neill and Allen, 2011), some other research has indicated a positive and significant relationship between the variance of team extraversion and team performance (Barry and Stewart, 1997; and Prewett et al., 2009).

Extraversion is a social interaction trait, and in project teams would be seen in the interaction necessitated by the group's divisible shared tasks. Extraversion is often reflected in leadership abilities. To be effective, a team requires both leaders and followers and thus a mix of extraverted and introverted members. A team with low overall team extraversion might flounder and drift without direction while a team comprised of mostly extraverts might experience friction and conflict also decreasing performance.

Therefore

H_3: In project teams, variance in team extraversion is associated with team performance such that higher (lower) levels of variance in team extraversion are associated with higher (lower) levels of team performance.

Team Emotional Stability

There have been extensive but contradictory findings in research examining relationships between all operationalizations of emotional stability and team performance. In an early work, Barry and Stewart (1997) found no relationship between mean emotional stability and team performance. These results were repeated in several more research projects. Neuman and

Wright (1999) found that minimum emotional stability is not related to performance. Neuman, Wagner, and Christiansen (1999) found no relationship between mean emotional stability and the dependent variable while their work reflected some evidence that variance in emotional stability is related to team performance. O'Neill and Allen (2011) did not find a relationship between mean, maximum, minimum or variance in emotional stability and team performance.

Using the variance operationalization lens, Kichuk and Wiesner (1997) found no relationship between neuroticism (the inverse of emotional stability) and performance, but did find the mean team emotional stability trait to differentiate between successful and unsuccessful teams in very broad terms. Because of the binary dependent variable (successful team and unsuccessful team), their findings could not speak to levels of success between one successful team and another, but did indicate a minimal acceptable level of emotional stability for a team to be successful. Barrick et al. (1998) found that mean emotional stability are related to performance, while maximum, minimum and variance in that trait are not. In an extensive meta-analysis of group personality composition, Prewett et al. (2009) found a relationship between mean and maximum emotional stability and team performance but found no relationship between that dependent variable and minimal or variance in the trait.

Clearly there is disagreement in the findings regarding the relationship between emotional stability and team performance. When significant relationships have been found at all, mean emotional stability has most frequently been the measure used as the independent variable, and the relationship has been positive.

Emotional stability is a trait that will enhance the successful completion of both unitary and divisible tasks. Individuals with higher levels of emotional stability are more likely to complete their individual tasks, and these same individuals are more likely to interact effectively

on divisible tasks with their teammates. Both outcomes are expected to lead to increased levels of team performance. Thus, the higher the level of emotional stability in all teams members the more effective.

Therefore

H_4: In project teams, mean team emotional stability is associated with team performance such that higher (lower) levels of mean team emotional stability are associated with higher (lower) levels of team performance.

Team Openness to Experience

Openness was not investigated or measured by Mohammed and Angell (2003) because it "is the least clearly defined of the FFM and has not generally emerged as a significant predicator of individual or team performance". Again research is divided on whether a significant relationship exists between this trait, openness, and team performance. Several studies found no relationship between openness and team performance even when operationalized in several different manners. For instance, while not hypothesized, Barry and Stewart (1997) found no relationship between openness and team performance when measuring proportion of team members with higher levels of the trait. Furthermore, Kichuk and Wiener (1997) found no relationship between mean openness and team performance. Lastly, Neuman and Wright (1999) found that minimum openness is not related to performance and a recent study by O'Neill and Allen (2011) did not find a relationship between maximum or variance in openness and team performance. However, Neuman, Wagner, and Christiansen (1999) found a positive relationship with team performance in both mean and openness and variance in the openness trait, but

surprisingly, O'Neill and Allen (2011) found a negative relationship between both mean and minimum openness and team performance.

While some research indicates that openness is very difficult to identify and interpret (Barrick and Mount, 1991), one possible explanation lies in the meaning of openness to experience as articulated by (McCrae and Costa, 1987). The six facets associated with openness are fantasy, aesthetics, feelings, actions, ideas, and values (Revised NEO-PI Costa, McCrae and Busch, 1986) are generally associated with creative tasks ands objectives, behaviors that may or may not be important to specific projects teams with specific targeted outcomes

Openness to experience in a project team could involve both unitary and divisible tasks. Similar to extraversion, too much openness might lead to a highly creative project team that produces breathtaking plans but little results. Contrariwise, a project team without any level of the openness trait might display task proficiency but without any creativity or spark, missing opportunities for new and more effective ways to accomplish team objectives.

Therefore

H_5: In project teams, variance in team openness is associated with team performance such that higher (lower) levels of variance in team openness are associated with higher (lower) levels of team performance.

Team Agreeableness

Again, the empirical findings on group agreeableness vary significantly across both similar and different operationalizations. Although not hypothesized, Barry and Stewart (1997) found no relationship between proportional agreeableness and team performance. Kichuk and Wiener (1997) found no relationship between mean agreeableness and team performance, while

Neuman, Wagner, and Christiansen (1999) and Halfhill, Nielson, et al. (2008) found no relationship between variance in team agreeableness and performance. Additionally, O'Neill and Allen (2011) did not find a relationship between mean, maximum, minimum or variance in openness and team performance. Prewett et al. (2009) found no relationship between maximum agreeableness and performance.

On the other hand, Neuman and Wright (1999) and Halfhill et al. (2005) both found that minimum agreeableness is positively related to performance. Neuman, Wagner, and Christiansen (1999) also found a positive relationship between mean agreeableness and performance. Halfhill, Nielson, et al. (2008) found that team mean and minimum agreeableness was positively related to team performance. Prewett et al. (2009) found a positive relationship between the mean, minimum and variance in agreeableness and team performance in their meta-analysis. Halfhill et al. (2005) found that while mean agreeableness related positively with team performance, variance in the trait suggests a negative and significant relationship with performance.

Agreeableness is a trait primarily concerned with social relationships (Graziano, Hair, and Finch, 1997) and would affect divisible tasks needing project team member interaction. As recommended by Bell (2007), team agreeableness is a stronger predictor of performance when operationalized as the team minimum.

Therefore

H_6: In project teams, minimum team agreeableness is associated with team performance such that higher (lower) levels of minimum team agreeableness are associated with higher (lower) levels of team performance.

Interaction between Team Agreeableness and Team Conscientiousness

To date little research has been conducted to investigate possible interactions between any of the five group team personality compositions in any of their operationalizations. However, Halfhill et al. (2005) and found that the interaction between agreeableness and conscientiousness suggested a positive relationship specifically with project team performance. It is proposed that on a team with both unitary and divisible tasks, agreeableness and conscientiousness would interact above and beyond the separate traits to manifest a highly capable and productive team. This exceptional team would be largely composed of individuals who could be informally described as "nice guy (or gal), works hard" (Woehr, 2009).

Therefore

H_7: In project teams, the interaction between team agreeableness and team conscientiousness is associated with team performance such that higher (lower) levels of this interaction are associated with higher (lower) levels of team performance.

Therefore

H_8: In project teams, the interaction between team agreeableness and team extraversion is associated with team performance such that higher (lower) levels of this interaction are associated with higher (lower) levels of team performance.

Therefore

H_9: In project teams, the interaction between team conscientiousness and team emotional stability is associated with team performance such that higher (lower) levels of this interaction are associated with higher (lower) levels of team performance.

The nine hypotheses are summarized in Figure 2.1.

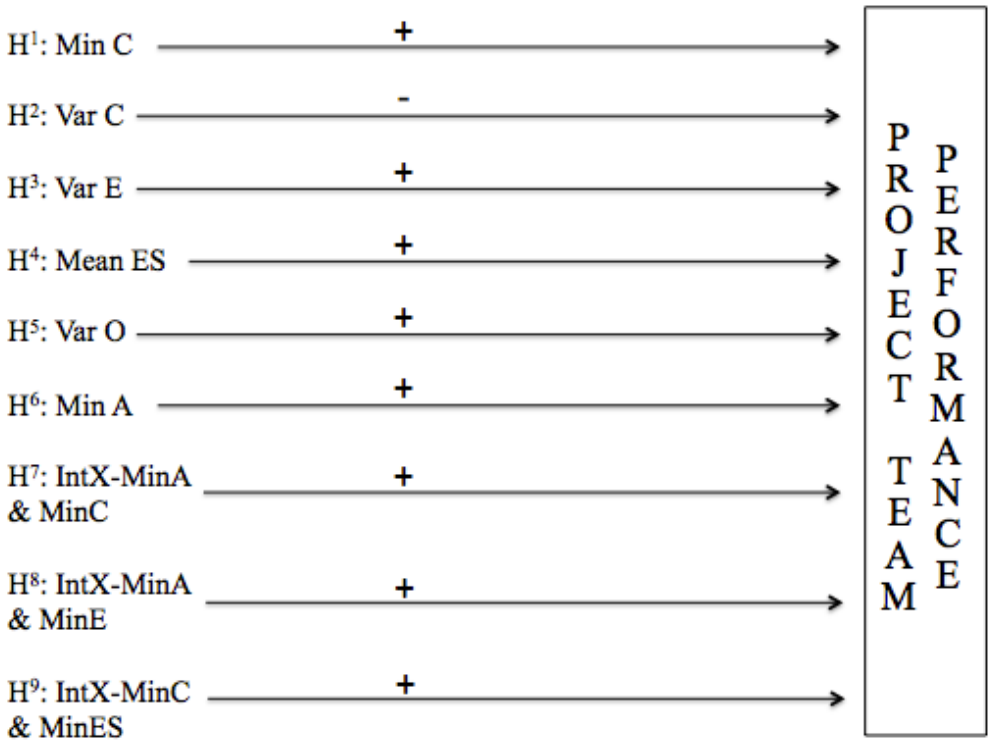

Figure 2.1 - Summary of Group Personality Composition Hypotheses

Literature Review Conclusion

This chapter provided an overview of the relevant literature related to group personality composition within the management and industrial/organizational psychology literatures. A careful review of current empirical and conceptual research reveals four significant areas that this study can improve upon and move forward: 1) overreliance on lab experiments with short time frames and insignificant personal outcomes for the study subjects; 2) use of weak and subjective dependent variables; 3) very small sample sizes; and 4) lack of team type specification in studies. The following chapter presents the methods used to test the nine hypotheses stated above, the measures used to operationalize each variable in the study, the control variables used to avoid confounding.

CHAPTER 3 - METHODS

Chapter Overview

This chapter explains the research methodology used to test the nine hypotheses regarding the relationship between group personality composition and team performance proposed in Chapter 2.

The chapter is organized into four sections. Following this overview, the research sample participants are described in detail, along with the procedures used to collect the data. The personality measure is introduced, described and justified, followed by descriptions of the group personality composition aggregation operationalizations. The application of hierarchical regression is then introduced and its use in this research is explained and justified. The chapter ends with a summary of the methodology.

Data Collection

I collected the data through student participation in a web-based business simulation designed for strategic management, business policy and capstone business courses. Use of simulations in academia has been called a scientific discipline (Wolfe and Crookall, 1998), offers real and numerous advantages as a platform for business research (Dickinson, Gentry, and Burns, 2004), and dates back nearly five decades to the Carnegie Tech Management Game (Cangelosi and Dill, 1965).

The simulation exposed the participants to all aspects of business including business management, finance, accounting, marketing, sales, marketing research, manufacturing and

operations, logistics, and human resources management and has been used by over 150,000 students and business professionals around the world since 1980 (Cadotte, 2012).

The course is a business core capstone taken during the second semester of the junior year after survey courses in economics, finance, marketing, supply chain management, accounting, statistics, and management have been successfully completed. The course is built around a business simulation, which guides the student through the planning and opening of a new business-to-business firm manufacturing and marketing desktop and laptop computers around the world in six regions and 24 city markets. Teams were formed in the second week of classes through a draft system, where students presented their resumes five at a time, and were subsequently chosen by five team human resource managers; the HR managers were chosen by the section coach prior to the class meeting. At the conclusion of the draft, each team had five members: VP Manufacturing, VP Marketing, VP Sales, VP Marketing Research, and VP Accounting/Finance. The leadership function of the team rotated, with each member serving as president for at least one operating period (a fiscal quarter) of the eight period simulation life (Course syllabus, 2012). For the complete course syllabus, please refer to Appendix A.

I collected data through an online survey on a secure university-hosted Qualtrics server. Following Institutional Review Board approval, the emails for the students enrolled in the classes are emailed a brief message describing the research, its purpose and the $1000 cash giveaway incentive. Students who completed the survey were entered into a random drawing for a $50 bill, with 20 winners chosen per semester course. The email concluded with a personalized link for each student to access and begin the survey, eliminating the need for usernames and passwords to access the simulation. I collected in the data over the course of three concurrent semesters in a single calendar year to avoid bias effects that might affect temporal validity, such

as significant changes in curriculum from academic year to academic year. There were significant changes to the source itself or any of its prerequisite courses during the simulation data collection.

Participants

The study participant population was undergraduate business majors at a large public university in the southeastern United States. The students worked on competitive teams with an average of 5 people per team.

Independent Variables

Personality Personality measures have been in use for well over six decades (Cattell, 1946). More recently, popular survey instruments have become validated and accessible for academic use (Costa and McRae, 1988; Goldberg, 1990). This project used a 50-item scale (Goldberg, 1992) and was available from the International Personality Item Pool (IPIP; Goldberg, 1999). The survey has been used in numerous GPC studies (Graziano, Hair, and Finch, 1997; Ployhart, Weekley, and Baughman, 2006; Quigley and Gardner, 2007; Baer, Oldham, Jacobsohn, and Hollingshead, 2008; O'Neill and Allen, 2010; Raver, Ehrhart, and Chadwick, 2012; Fisher, Bell, Dierdorff, and Belohlav, 2012). As discussed in Chapter 2, the five factor model of modern personality trait theory is comprised of five well-accepted buckets of traits comprised of extroversion, openness to experience, emotional stability, agreeableness, and conscientiousness. The Goldberg scale has 10 items for each of the five traits and reflects an acceptable median Cronbach's alpha coefficients (α) of .82 (Goldberg, 1999). More specifically, Waldman et al. (2004) reported further coefficients as follows: extroversion (α=.87), openness to experience (α=.86), emotional stability (α=.87), agreeableness (α=.85), and

conscientiousness (α=.88). The fifty-item scale used in this paper (see Appendix B for the full scale) is a viable measure of the Big 5, and displays both reliability and construct validity (Socha, Cooper, and McCord, 2010), as well as convergent validity (Goldberg, 1999).

Operationalizations of Group Personality Composition Presently, there are no universally accepted procedures to directly measure team personality at the group level (Long, Lonergan, Bolin, and Neuman, 2000), therefore to test the nine hypotheses, this research used the natural raw total scores for each of the five personality traits (extroversion, conscientiousness, openness to new experience, emotional stability, and agreeableness) and aggregate them for each team. Aggregation of individual personality trait scores to a group level was justified (Barry and Stewart, 1997; Peeters, Rutte, Tuijl, and Reymen, 2008), is often used in GPC research (Graziano, Hair, and Finch, 1997; Baer, Oldham, Jacobsohn and Hollingshead, 2008), and allowed for the examination of group level independent and dependent variables (Bradley, 2008). Therefore, it is generally agreed that personality can be "meaningfully explored" at the group level of analysis (George and James, 1993).

GPC Mean Aggregation Using a five-member team as an example, each member would have a score between 1 and 7 on each of the ten items for each trait. The lowest possible individual score for a trait would be a 10 (10 x 1) and the highest possible score would be a 70 (10 x 7). For example, the five members of Team X have individual scores for extraversion of 67, 45, 61, 53, and 29 respectively. The aggregated mean GPC for Team X on extraversion is the sum of the individual scores listed above divided by 5, or 50.8. The GPC mean aggregation is used to test H4 (emotional stability).

GPC Minimum Aggregation The GPC minimum aggregated score represents the member lowest score out of 70 for a personality trait. Again using Team X with individual

extraversion scores (67, 45, 61, 53, and 29), the GPC minimum would be 29, the lowest team member's score. The GPC minimum aggregation is used to test H1 (conscientiousness) and H6 (agreeableness).

GPC Variance Aggregation The GPC variance represents the variance represented in the team members' scores for that particular trait. The GPC variance aggregation is used to test H2 (conscientiousness), H3 (extraversion), and H5 (openness to experience). As suggested by Mohammed and Angell (2003), for these particular hypotheses the mean value of the GPC trait will be entered into the hierarchical regression as a control variable and the variance in the next step, allowing for a more precise measure of the trait variance's effect on team performance.

Following calls for broader operationalizations of group personality composition (Anderson, 2009), this paper thus uses mean, minimum, and variance to produce a wider and clearer understanding of the relationship between these important team traits and team performance. The next section explains how this paper defines and quantitatively measures team performance.

Dependent Variable

Team Performance Answering calls for more objective dependent variables in group personality composition (Peeters, Rutte, Tuijl, and Reymen, 2006), this study's team performance was measured by the simulation's cumulative balanced scorecard after eight fiscal quarters of competition. This metric measured each team's performance based on financial results, market effectiveness, marketing performance, investments in the firm's future, human resource management, creation of wealth, asset management, and manufacturing productivity (the full explanation of the calculation is listed in Appendix C). Therefore, the cumulative balanced scorecard offered dependent variable upon which to evaluate each team's relative

performance against all the other teams in the study. Owing to the different possible balanced scorecard outcomes relative to each simulation universe in each section, the balanced scoreboard composite metric was standardized by taking the z-score of each team's balanced scorecard outcome relative to each section's balanced scorecard mean.

Control Variables

Previous studies suggested controlling for team size and course section in group personality composition research (Mohammed and Angell, 2004; Guzzo and Dickson, 1996; Hambrick and D'Aveni, 1992; and Wiersema and Bantel; 1992).

Size of Team The number of team members can affect team performance (Wiersema and Bantel; 1992; Guzzo and Dickson, 1996). In this particular simulation, teams normally have five members but can operate successfully with as few as three or as many as six. (Teams sizes may vary based on the number of students per course section and late student drops from the course.) Team performance may deteriorate with smaller teams due to overwork and with larger teams due to social loafing, thus team size was included as a control variable (Mohammed and Angell, 2003).

Course Sections This study proposed that course section would correlate with team performance in an unknown direction due to the active facilitation of the business coach in the simulation. Business coaches were recruited into the simulation by the lead faculty, came from different industry backgrounds, and had differing levels of experience with the simulation.

Data Analysis

Hierarchical Regression

Hierarchical regression is appropriate when it is necessary to control for independent variables that are theorized in the research or confirmed in advance in the literature to have a correlation with the dependent variable but are not of interest in the current model (Cohen, Cohen, West, and Aiken, 2003). The process expands on ordinary regression by adding a second stage "prior" regression to a standard model (Witte and Greenland, 1996) that allows the assessment of change in the proportion of variance explained (R^2) with each new block of variables added. Specifically this regression type will allow the separation of a non-germane covariate's effect from the variables of interest including group personality composition and their effect on group performance.

As shown in Table 3.1, the independent variables course section and team size were regressed in the first block. As discussed in this paper, previous research has suggested these independent variables are possibly correlated with team performance for reasons having no relationship to group personality composition. (As noted, Hypotheses 2, 3, and 5 were also first be controlled for the GPC trait mean calculated at he individual team level.)

The second block of independent variables of interest as hypothesized in Chapter 2 are minimum group conscientiousness, variance in group conscientiousness, variance in group extraversion, mean emotional stability, variance in group team openness, and minimum group team agreeableness. To test each hypothesis, each of these variables of interest was added in the second step and regressed on the dependent variable separately from the first six hypotheses.

The last set of independent variables tested the relationships between the dependent variable and three separate interaction effects. H_7 investigated the interaction effects between

two of the facets, Agreeableness and Conscientiousness. H_8 studied the interaction effects between the facets Agreeableness and Extraversion and H_9 examined the interaction effects between the facets Conscientiousness and Emotional Stability. These final three hypotheses were operationalized using group minimum scores (Halfhill, 2007).

Table 3.1 - Hierarchical Regression Steps

Stage One – Control Variables Team Size Course section
Stage Two – Independent Variables (regressed individually) H^1: Conscientiousness (minimum) H^2: Conscientiousness (variance) H^3: Extraversion (variance) H^4: Emotional stability (mean) H^5: Openness (variance) H^6: Agreeableness (minimum)
Stage Three – Interactions H^7: Interaction between agreeableness (minimum) and conscientiousness (minimum) H^8: Interaction between agreeableness (minimum) and extraversion (minimum) H^9: Interaction between conscientiousness (minimum) and emotional stability (minimum)

Chapter Summary

In this chapter overview, the research sample participants were described in detail, along with the procedures used to collect the data. The personality measures were introduced, described and justified. Description and rationalization of the group personality composition aggregation operationalizations were offered. The application of hierarchical regression was introduced and its use was explained and justified.

CHAPTER 4 – STUDY FINDINGS

Chapter Overview

The results of the statistical analysis are reported in the following three sections. The first section describes the participants and reports descriptive statistics, scale validity, and reliability. The second section discusses control variables and the dependent variable. The final section reports the results of the nine hypotheses.

Study Participants

The data were collected in the course of four concurrent semesters to avoid bias effects that might diminish temporal validity, such as significant changes in curriculum from academic year to academic year. From a course population of 1123 students, there were a total of 787 survey responses. The overall response rate was 70%, with individual semester percentage response rates at 68.8%, 77.3%, 71.2%, and 69.8%. While these response rates were statistically different t (3) = 37.62, $p < .000$, the largest response rate was observed during a summer semester when the project was explained to the students in a smaller setting of 44 students, rather than in a large auditorium with 250 - 411 students at a time. Furthermore, the summer students had a higher probability of winning a $50 bill (1 in 22) than did the students in the regular "large" fall or spring semesters (1 in 37.4).

As shown in Table 4-1, 64.4% of the respondents were male. This proportion was not statistically different as compared to the business school's enrollment for the same time period t (1) = 0.00, *n.s.* Furthermore, 84.8% were white, 6.2% Asian, 5.7% Black or African American, and 1.1% Hispanic/Latino. The remaining 2.2% were comprised of American Indian, Native Hawaiian/Other Pacific Islander, or Other. 94.2% of the respondents were born in the United

States, 1.8% in China, 1.1% in Western Europe, and the remaining 2.3% in India, Asia (excluding China and India), Africa, Eastern Europe, Russia, and Canada. The race and/or ethnicity of the survey respondents were not statistically different from the composition reflected in the business school during that academic year t (5) = 0.023, *n.s*.

The respondents represented the following majors: 31.5% in logistics, 20.1% in accounting, 16.6% in marketing, 14.1% in management/HRM, 10.9% in finance, and the remaining 6.8% in economics and statistics/business analytics. The majors reflected in the sample were not statistically different from the proportions reflected in the business school during that academic year t (8) = 0.020, *n.s*.

74.3% of the respondents self-reported above average GPA's (grade points averages of 3.0 or better on a 4 point scale). Of these students, 43.3% stated between a 3.0 and 3.4, and 31% indicated a GPA above 3.5. Comparable numbers were not available from the business school.

Table 4.1 - Survey Response Demographics

Gender	Frequency	Percent
Male	507	64.4%
Female	280	35.6%
Total	787	100.0%

Race and Ethnicity	Frequency	Percent
American Indian or Alaska Native	5	.6%
Asian	49	6.2%
Black or African American	45	5.7%
Hispanic/Latino American	9	1.1%
Native Hawaiian and Other Pacific Islander	1	.1%
White	667	84.8%
Other	11	1.5%
Total	787	100.0%

Table 4.1 - Survey Response Demographics (Continued)

Birthplace	Frequency	Percent
United States	741	94.2%
Canada	1	.1%
China	14	1.8%
India	4	.5%
Asia (excluding China and India)	6	.8%
Central America (including the Caribbean, excluding Mexico)	1	.1%
Western Europe	9	1.1%
Russia	2	.3%
Eastern Europe	4	.5%
Africa	5	.6%
Total	787	100%

Age	Frequency	Percent
Under 20	6	.8%
20-24	722	91.7%
25-29	34	4.3%
30-34	15	1.9%
35-39	3	.4%
40 or older	7	.9%
Total	787	100%

Major/Concentration	Frequency	Percent
Accounting/Internal Audit	145	18.4%
Business Analytics/Statistics	10	1.3%
Economics	26	3.3%
Finance	86	10.9%
Human Resource Management	32	4.1%
Logistics	248	31.5%
Management	79	10.0%
Marketing	131	16.6%
Other	30	3.8%
Total	787	100%

GPA (Grade Point Average)	Frequency	Percent
Under a 2.0	1	.1%
2.0 - 2.4	13	1.7%
2.5 - 2.9	188	23.9%
3.0 - 3.4	341	43.3%
3.5 - 4.0	244	31.0%
Total	787	100%

Table 4.1 - Survey Response Demographics (Continued)

Functional Area	Frequency	Percent
VP Marketing	170	21.6%
VP Sales Management	157	19.9%
VP Marketing Research	144	18.3%
VP Manufacturing	166	21.1%
VP Finance and Accounting	150	19.1%
Total	787	100%

The remaining 25.7% reported grade point averages at or below 2.9.

92.5% of the respondents reported an age of 24 years old or less. 4.3% reported an age between 25 and 29, and the remaining 3.2% respondents were 30 years old or more.

232 teams competed in the simulation over four semesters. 33 teams had less that 50% of the group members complete the survey and were eliminated from the data set, initially leaving 199 teams with complete and usable data at the team level. The removal of these teams decreased the net individual response rate to 722 subjects, or 64%.

A post hoc power analysis was conducted using G*Power (Faul, Erdfelder, Buchner, et al., 2009). The power calculation used the sample size of 199 teams at $\alpha = 05$ in a two-tailed test at three levels of effect size (.1, .3 and .5), as suggested by Cohen (1988). A three predictor variable equation was used, denoting two control variables and one independent variable as seen in Hypotheses 1 through 6. At the .1 effect size, the sample collected generates power ($1- \beta$) of .96; with an effect size of .3 and .5, power approaches 1. Therefore, insufficient sample size was likely not a factor in this study.

IPIP Personality Scale Validity

As discussed in the previous chapter, the Goldberg scale has ten items for each of the five traits and reflects an acceptable overall median Cronbach's alpha coefficient (α) of .82 (Goldberg, 1999). Waldman et al. (2004) reported alpha as follows: extroversion (α=.87), openness to experience (α=.86), emotional stability (α=.87), agreeableness (α=.85), and conscientiousness (α=.88). In this study, the Cronbach's alpha scores were similar and significantly above acceptable limits. The reliability results were: extroversion (α=.88), openness to experience (α=.79), emotional stability (α=.87), agreeableness (α=.73), and conscientiousness (α=.81).

Furthermore, the 50 items of the Goldberg personality pool were subjected to exploratory factor analysis (EFA) at the individual response level. The suitability of the data analysis was confirmed as follows. First, inspection of the correlation matrix indicated the presence of many coefficients of .3 and above. Furthermore, the Kaiser-Meyer-Olkin value of .843, surpassing the suggested value of .6 (Kaiser, 1970) and Bartlett's Test of Sphericity (Bartlett, 1954) was significant, $\chi^2(1225) = 13137.254$, $p < .000$, supporting the factorability of the correlation matrix. The factor analysis was conducted using the maximum likelihood extraction method and Oblimin rotation. A scree plot was generated (see Appendix E) and clearly indicated a 5 factor model. The chi-square goodness-of-fit test is statistically significant: $\chi^2(985) = 3620.447$, $p < .0000$. We can conclude that there are statistically significant differences between the five personality traits and that those traits load to the appropriate factors as measured by the Goldberg 50-item scale.

Therefore, the fifty-item scale is confirmed as a viable measure of the Big 5, and displays both reliability and construct validity.

Dependent Variable Calculation

As discussed in Chapter 3, to capture the idiosyncratic competitive and dynamic outcomes of specific teams competing against each other, the z-scores for team performance were calculated one universe at a time (ZSCORE). A universe is the simulation's classification of a set of four teams directly and interactively competing against each other. Therefore, to capture each team's performance, the raw balanced scorecard results for a single universe (see Appendix C) were compared to each other, zero-centered, and z-scores simultaneously created for those four teams. For example, a single course section in the Fall 2012 semester was identified as universe FA12002 and contained four teams. More than 50% of the team members on all four teams in the FA12002 completed the survey; therefore the team data was usable in the research project. These four teams had final balanced scorecard outcomes for the simulation based on 9 metrics (see Appendix C) and incorporated into a single final measure. The four teams' scores were 13, 80, 9, and 6 respectively. The lowest possible score is 0 and there was no ceiling on high performance, although universe high-range scores have been observed in the 2000 - 3000 range. Standardized scores were then calculated with the scores of -0.39493, 1.49508, -0.50776, and -0.59239 respectively, and thereafter utilized as the dependent variables for these teams. This process was repeated for each reporting team in each simulation universe.

Findings

Control Variables

IBM SPSS Version 21 was the software package chosen to analyze the data. As discussed previously, based on a careful review of the literature, team size (termed TEAMSIZE) and course section (termed SECTION) were chosen as control variables for inclusion in Model 1

of the hierarchal regression. Mean team size was 4.77 members with a standard deviation of .476 based on 199 teams. Prior to inclusion in the hierarchical regression, both control variables were regressed with the dependent variable, termed (ZSCORE). Based on the data used, the control variable team size was not significantly related to team (ß = .041; *n.s*. Furthermore, the control variable course section (universe) also did not reveal a relationship with team performance (ß = .012; *n.s*).

Findings for the Research Hypotheses

Table 2 shows the means, standard deviations, and correlations among study variables. (Note: the unstandardized and standardized coefficients, *t*-values, and *p*-values for each of the nine hypotheses are detailed in Appendix D). The first six hypotheses investigated measures reflecting the relationship between single group personality composition variables and team performance. Multicollinearity can interfere with measurement of independent variable significance in a multiple regression and may be problematic if the VIF score exceeds 10 or tolerance approaches less than .1 (Hair, Black, Babin, and Anderson, 2010). To detect multicollinearity, variance inflation factor and tolerance were calculated for each hierarchical regression and reported.

Table 4.2 – Descriptive Statistics[a]

	Mean	SD	TEAM SIZE	ZSCORE	CONSC MIN	CONSC MAX	CONSC MEAN	CONSC VAR	AGREE MIN	AGREE MAX	AGREE MEAN
TEAMSIZE	4.77	.48	1								
SECTION	12.26	7.24	-.086								
ZSCORE	.016	.87	.041	1							
CONSCMIN	43.96	6.82	-.236**	-.050	1						
CONSCMAX	59.60	5.74	.113	-.042	.338**	1					
CONSCMEAN	51.73	5.09	-.034	-.060	.774**	.761**	1				
CONSCVAR	7.58	3.34	.162*	.017	-.632**	.406**	-.167*	1			
AGREEMIN	46.66	6.92	-.297**	-.144*	.145*	-.017	.055	-.055	1		
AGREEMAX	61.28	4.86	.032	-.088	.087	.219**	.155*	.051	.248**	1	
AGREEMEAN	54.26	4.42	-.180*	-.150	.147*	.116	.139	-.022	.798**	.683**	1
AGREEVAR	7.052	3.48	.179*	.077	-.034	.100	.049	.056	-.727**	.411**	-.290**
EXTRAMIN	38.12	8.87	-.159*	-.015	.084	-.050	-.014	-.014	.274**	.144*	.259**
EXTRAMAX	56.81	6.18	.025	-.017	.007	.132	.030	.064	.135	.324**	.273**
EXTRAMEAN	47.88	5.75	-.139*	.008	.055	.029	.006	.015	.266**	.270**	.336**
EXTRAVAR	9.00	4.18	.057	.010	-.004	.091	.041	.027	-.126	.054	-.060
EMOSTABMIN	34.93	7.94	-.170*	-.033	.210**	-.112	.065	-.224**	.137	.058	.138
EMOSTABMAX	53.13	7.67	.117	-.015	-.088	.060	.002	.042	-.099	.167*	.077
EMOSTABMEAN	44.20	6.08	-.030	-.024	.092	-.016	.056	-.120	.012	.102	.108
EMOSTABVAR	8.62	4.28	.158*	.028	-.224**	.115	-.055	.248**	-.132	.060	-.032
OPENMIN	43.77	5.95	.000	-0.005	.125	-.045	.048	-.119	.101	.103	.129
OPENMAX	57.86	5.20	-.055	.126	.018	.079	-.022	.049	.096	.165*	.126
OPENMEAN	50.81	4.13	-.023	.104	.093	.016	.024	-.047	.142*	.187**	.188**
OPENVAR	6.89	3.39	-.205**	0.086	-.033	.042	-.055	.109	.089	.024	.041

[a] N = 199

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.2 – Descriptive Statistics[a] (Continued)

	AGREE VAR	EXTRA MIN	EXTRA MAX	EXTRA MEAN	EXTRA VAR	EMO STAB MIN	EMO STAB MAX	EMO STAB MEAN	EMO STAB VAR	OPEN MIN	OPEN MAX	OPEN MEAN	OPEN VAR
AGREEVAR	1												
EXTRAMIN	-.078	1											
EXTRAMAX	.062	.281**	1										
EXTRAMEAN	-.040	.782**	.695**	1									
EXTRAVAR	.108	-.723**	.366**	-.263**	1								
EMOSTABMIN	-.045	.171*	.010	.124	-.090	1							
EMOSTABMAX	.127	-.014	.196**	.072	.070	.228**	1						
EMOSTABMEAN	.025	.088	.128	.111	-.017	.704**	.734**	1					
EMOSTABVAR	.117	-.052	.142*	.018	.083	-.584**	.582**	.016	1				
OPENMIN	.030	.232**	.111	.214**	-.127	.028	-.072	-.034	-.072	1			
OPENMAX	.015	.172*	.219**	.289**	-.009	-.056	.152*	.037	.182*	.227**	1		
OPENMEAN	.031	.312**	.207**	.381**	-.147*	.030	.057	.046	.051	.724**	.746**	1	
OPENVAR	-.053	.044	.060	.087	.044	-.004	.086	.038	.127	-.635**	.528**	-.051	1

[a] N = 199

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 1 proposed that in project teams, after controlling for team size and course section, minimum team conscientiousness is significantly and positively associated with team performance. A Shapiro-Wilk test was performed (Hair et al., 2010) and indicated that the minimum team conscientiousness variable was normally distributed.

Table 4.3 – Results of Hierarchical Regression Analysis for Hypothesis 1

	Model 1		Model 2	
Constant	-0.373	(0.646)	-0.044	(.866)
Controls				
Team Size	0.077	(.131)	0.058	(.135)
Course Section	0.002	(.009)	0.002	(.009)
Minimum Conscientiousness			-0.005	(.009)
ΔR^2			0.002	
ΔF			0.141	
R^2	0.002		0.004	
F	0.185		0.326	

Note: N=199. Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

Multicollinearity was not a concern with the lowest tolerance reported at >.935 and the highest VIF <1.069.

The two control variables team size and course section were added into each Model 1 of the hierarchical regressions as for the first six hypotheses. The hierarchical multiple regressions revealed that the control variables did not contribute significantly to the regression model, F (2,196) = .185, *n.s.* The minimum conscientiousness measure (CONSCMIN) was added to the regression for Model 2, and shown in Table 4.2, the variable did not show any significant increase in variation explained, ΔF (3,195) = .141, *n.s.* Hypothesis 1 was not supported.

Hypothesis 2 stated that in project teams variance in team conscientiousness is negatively and significantly associated with team performance. A Shapiro-Wilk test indicated that the distribution for variance in team conscientiousness was normal. As reported in Table 4.3, there was no change reflected in R^2 after the addition of the variance in conscientiousness measure, (0.00), and the regression reflected a non-significant effect ΔF (3,195) = .019, *n.s*. This hypothesis was not supported.

Table 4.4 – Results of Hierarchical Regression Analysis for Hypothesis 2

	Model 1		Model 2	
Constant	-0.373	(.646)	-0.377	(.649)
Controls				
Team Size	0.077	(.131)	0.074	(.133)
Course Section	0.002	(.009)	0.002	(.009)
Conscientiousness Variance			0.003	(.019)
ΔR^2			0	
ΔF			0.019	
R^2	0.002		0.002	
F	0.185		0.129	

Note: N=199. Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

Again, multicollinearity was not present, with the lowest tolerance reported greater than .965 and the highest VIF less than 1.036.

The third hypothesis proposed that in project teams, variance in team extraversion would be positively and significantly associated with team performance. While the relationship was positive as depicted in Table 4.5, the effect was not significant and this hypothesis was not supported, ΔF (3,195) = .009, *n.s*.

Table 4.5 – Results of Hierarchical Regression Analysis for Hypothesis 3

	Model 1		Model 2	
Constant	-0.373	(.646)	-0.377	(.649)
Controls				
Team Size	0.077	(.131)	0.074	(.133)
Course Section	0.002	(.009)	0.002	(.009)
Extraversion Variance			0.001	(.015)
ΔR^2			0	
ΔF			0.009	
R^2	0.002		0.002	
F	0.185		0.126	

Note: N=199. Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

Multicollinearity was absent, with the lowest tolerance reported at >.989 and the highest VIF <1.011.

The fourth hypothesis specified that in project teams, mean team emotional stability is positively and significantly associated with team performance. A Shapiro-Wilk test indicated that the distribution for the variable mean team emotional stability was not normal (df = 199, *p*=.027) and further investigation though the box plot analysis suggested that there were four suspect outliers (Teams 44, 65, 147, 195). After careful investigation of the original raw data, there was justification to exclude these four team scores from the analysis as extreme outliers. The test for normal distribution was repeated, and revealed a non-significant and thus acceptable Shapiro-Wilk score (df = 191, *p*=.648). As reflected in Table 4.6, the hypotheses was tested and lacked support for a significantly different change in variance ΔF (1,191) = .0016, *n.s*.

Table 4.6 – Results of Hierarchical Regression Analysis for Hypothesis 4

	Model 1		Model 2	
Constant	-0.531	(.658)	-0.599	(.853)
Controls				
Team Size	0.002	(.133)	0.002	(.134)
Course Section	0.107	(.009)	0.108	(.009)
Mean Emotional Stability			0.001	(.011)
ΔR^2			0	
ΔF			0.0016	
R^2	0.004		0.004	
F	0.339		0.23	

Note: N=195. Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

Again, multicollinearity was not present, with the lowest tolerance reported at >.984 and the highest VIF <1.016.

Hypothesis 5 stated that in project teams, variance in team openness is positively and significantly associated with team performance. The Shapiro-Wilk test for normality was calculated with significant results, and analysis of the variable's histogram revealed a positively skewed distribution. The variable OPENVAR was successfully transformed into a new variable (OPENVARSQRT) using the recommended square root method (Tabachnick and Fidell, 2007).

Table 4.7 – Results of Hierarchical Regression Analysis for Hypothesis 5

	Model 1		Model 2	
Constant	-0.373	(.646)	-0.733	(.726)
Controls				
Team Size	0.077	(.131)	0.1	(.133)
Course Section	0.002	(.009)	0.001	(.009)
Openness Variance			0.101	(.093)
ΔR^2			0.006	
ΔF			1.177	
R^2	0.002		0.008	
F	0.185		0.516	

Note: N=199. Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

The new z-score variable was tested in the second block of hierarchical regression and as shown in Table 4.7, the hypothesis was not supported ΔF (3,195) = 1.177, *n.s*. The lowest tolerance was greater than .967 and the highest VIF was less than 1.034, indicating no multicollinearity present.

Hypothesis 6 states that in project teams, minimum team agreeableness is positively and significantly associated with team performance. The relationship between minimum team agreeableness is presented in Table 4.8, ΔF (3,195) = 3.739, *n.s.* There is no significant additional variance in the dependent variable above what is already explained by the two control variables.

Table 4.8 – Results of Hierarchical Regression for Analysis Hypothesis 6

	Model 1		Model 2	
Constant	-0.373	(.646)	0.875	(.910)
Controls				
Team Size	0.077	(.131)	-0.004	(.137)
Course Section	0.002	(.009)	0	(.009)
Minimum Agreeableness			-0.18	(.009)
ΔR^2			0.019	
ΔF			3.739	
R^2	0.002		0.021	
F	0.185		1.372	

Note: N=199. Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

Multicollinearity was not a concern with the lowest tolerance greater than .901 and the highest VIF less than 1.110.

Following the non-significant findings in the first six hypotheses, an alternative calculation of the dependent variable was investigated. Each team's performance within its competitive universe was ranked 1, 2, 3 or 4. In order to evaluate the possible relationship between the group personality composition variables and the team performance defined by rank, I performed an ordinal logistic regression using a cumulative logit link function. The overall test for model significance results was not significant and therefore the independent variables did not significantly predict the team ranking, $\chi^2(6) = 3.5$, *ns*.

The final three hypotheses examined the proposed possible interactions between different combinations of group personality composition variables and team performance. Multiple regression was used. To reduce multicollinearity, each independent variable was first centered and a new variable created (AGREEMIN_CTR, CONSCMIN_CTR, EXTRAMIN_CTR, and EMOSTABMIN_CTR).

Hypothesis 7 projected that in project teams, the interaction between minimum team agreeableness (AGREEMIN_CTR) and minimum team conscientiousness (CONSCMIN_CTR) is positively and significantly associated with team performance. After centering, the two variables of interest were multiplied to create a product variable (AGREEMIN_CTR X CONSCMIN_CTR). Multicollinearity was not present, as the highest variance inflation factor was less than 1.0191 and lowest tolerance greater than .982, both within acceptable ranges. As reported in Table 4.9, this hypothesis is not supported ΔF (3,195) = 1.535, *n.s.*

Table 4.9 – Results of Interaction Analysis for Hypothesis 7

	Model 1		Model 2	
Minimum Agreeableness	-0.018	(.009)	-0.018	(.009)
Minimum Conscientiousness	-0.004	(.009)	-0.002	(.009)
Minimum Agreeableness x Minimum Conscientiousness			-0.001	(.001)
ΔR^2				
ΔF			1.535	
R^2	0.022		0.029	
F	2.166		1.96	

Note: N=199 Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

The eighth hypothesis put forth that in project teams, the interaction between minimum team agreeableness (AGREEMIN_CTR) and minimum team extraversion (EXTRAMIN_CTR) is positively and significantly associated with team performance. This hypothesis is not supported ΔF (3,195) = .093, *n.s.*

Table 4.10 – Results of Interaction Analysis for Hypothesis 8

	Model 1		Model 2	
Minimum Agreeableness	-0.19	(.009)	-0.19	(.009)
Minimum Extraversion	0.03	(.007)	0.03	(.007)
Minimum Agreeableness x Minimum Extraversion			0	(.001)
ΔR^2			0	
ΔF			0.093	
R^2	0.021		0.022	
F	2.141		1.452	

Note: N=199 Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

Again, multicollinearity was not present, with the lowest tolerance reported at greater than .924 and the highest VIF less than 1.082.

The ninth and final hypothesis states that in project teams, the interaction between minimum team conscientiousness (CONSCMIN_CTR) and minimum team emotional stability (EMOSTABMIN_CTR) is positively and significantly associated with team performance. After the variables were centered, a product variable was created (CONSCMIN_CTR X EMOSTABMIN_CTR) with which to test the hypothesis. Multicollinearity is not an issue with tolerance no less than .931 and VIF no larger than 1.074.

This hypothesis is not supported ΔF (3,195) = .526, *n.s.*

Table 4.11 – Results of Interaction Analysis for Hypothesis 9

	Model 1		Model 2	
Minimum Conscientiousness	-0.006	(.009)	-0.007	(.009)
Minimum Emotional Stability	-0.003	(.008)	-0.002	(.007)
Minimum Emotional Stability x Minimum Conscientiousness			0.001	(.001)
ΔR^2			0.003	
ΔF			0.526	
R^2	0.003		0.006	
F	0.3		0.375	

Note: N=199 Unstandardized coefficients shown, with standard errors in parentheses.
$^{\dagger}p<.10$. $^{*}p<.05$. $^{**}p<.01$. $^{***}p>.001$.

In summary, none of the nine hypothesized relationships were supported in this research. In Chapter 5, I will present detailed explanations for these findings. The complete correlation table for all twenty operationalizations of the five-factor model, the control variables and the dependent variable are reported in Table 4.3.

Chapter Summary

In this chapter overview, the research participants were described in detail by gender, race and ethnicity, birthplace, age, major/concentration, grade point average, and functional area in the simulation. The hierarchical regression results failed to provide support for the first six hypotheses, and multiple regression and interaction analysis did not reveal support for the final three hypotheses.

The next chapter will discuss the meaning and implications of this study's findings and consider contributions to research and practice as well as possible limitations. Impactful avenues for future will be considered, followed by the study's conclusion.

CHAPTER 5 – DISCUSSION AND CONCLUSIONS

This chapter will examine the research project findings. Possible reasons for the lack of support for the hypotheses are then discussed. Contributions to both research and practice are considered, as well as the study's limitations. A continued stream of research is envisioned and detailed, followed by the study's conclusions.

Discussion

Use of Student Sample

While there has been debate regarding the use of student samples (McNemar, 1946; Sears, 2008; Peterson, 2001), the practice is widely accepted in personality research (Cooper, McCord, and Socha, 2011). For example, in the 510 samples reported in the Journal of Personality and Social Psychology in 2002, 85% were student samples (Henrich, Heine, and Norenzayan, 2010).

Furthermore, since 1996, eleven empirical papers on group personality composition using student samples were published and subsequently highly-cited in journals including the *Journal of Applied Psychology*, the *Journal of Organizational Behavior*, *Small Group Research* and the *European Journal of Personality* (Barry and Stewart, 1997; Graziano, Hair, and Finch, 1997; Kichuk and Wiesner, 1997; Waung and Brice, 1998; Mohammed and Angell, 2003; Waldman, Atwater, and Davidson, 2004; Mohammed and Angell, 2004; Baer, Oldham, Jacobsohn, and Hollingshead, 2008; Peeters, Rutte, Tuijl, and Reymen, 2008; Humphrey, Hollenbeck, Meyer, and Ilgen, 2011; and O'Neill and Allen, 2011).

Additionally, research comparing student and non-student samples of the same age through the same multi-dimensional measure have reported little unexplained difference between the two groups (Woehr, Miller, and Hudspeth, 2002). Peeters, Rutte, Tuijl, and Reymen's GPC meta-analysis (2006) also found no difference on the agreeableness and conscientiousness traits

between professional and students teams. Moreover, the group personality composition effects studied in this paper considered how GPC directly leads to project team performance.

Lastly, student versus non-student status is not relevant to the fundamental traits and outcomes under review, thus any results are generalizable to any project team.

Failure of the Dependent Variable to Accurately Measure Team Performance

"The complete nonsignificance of the regression results suggests strongly that the dependent variables were inadequately measured…" (West and Schwenk, 1996).

Broadly conceptualized, there are five possible explanations reasons for unsupported hypotheses (Pitcher and Smith, 1996). 1) The hypothesis and the underlying theory behind it are simply incorrect and therefore generate no support. Rather, the null hypothesis correctly remains intact and supported. 2) Moderator variables are not considered that attenuate or overwhelm existing variance. The theory is correct but important factors are missing. 3) Similarly, mediating variables are left out, again cloaking variance that would otherwise lead to significant results. 4) Independent or dependent variables, or a combination of such, are poorly measured. The underlying theory is valid, but the operationalization does not accurately report the existing relationships. 5) A last possible cause for non-significant findings is slight misspecification both the independent and dependent variables, leading to an interaction that cancels out any statistical significance.

First, as for this research project's non-significant findings, considerable previous research indicates strong, detectable relationships between group personality compositions in teams in general (Bell, 2007) and specifically project teams (Halfhill et al., 2005, Halfhill et al., 2008). There is no evidence supporting the rejection of the considerable GPC relationships with team performance presented in previous research.

Second, this research proposed no moderating or mediating variables. However, a large number of process variables may intervene between demographic independent variables (such as group personality composition) and team or organization dependent variables (Lawrence, 1997). Established on the extant literature, some process variables might mediate the group personality composition – project team performance relationship and may be present in this study. Such mediators identified in the literature include strategic-decision making process modes (Hart, 1992; Hart and Banbury, 1994), communication (Smith, Smith, Olian, Sims, Obannon, and Scully, 1994), and competitiveness (Graziano et al., 1997). Moderators that could also muddle this study's hypothesized relationships include job (project)-relatedness of diversity variables (Pelled, 1996), social integration among the team members (Smith et al., 1996), and frequency and type of communication of between team members (Lawrence, 1997). Additionally, conflict (Jehn, 1992; Pelled, 1996) and cohesion (Cota, Evans, Dion, Kilick, and Longman, 1995; Barrick et al., 1998) might mediate or moderate the relationship between group personality composition and project team performance. These two variables are promising avenues for future research into mediating effects existing between group personality composition and project team performance. In summary, some of these process variables may indeed mediate and/or moderate the relationship between group personality composition and team performance. This possibility provides an interesting and possibly fruitful area for continued research investigating the relationship between these GPC-based team member characteristics, intervening process variables, and performance outcomes.

Third, as the independent variable measures have been well used and supported, there is no evidence of misspecification. As discussed earlier in this paper, a broad body of empirical research supports the specification of group personality composition through the aggregation of

individual personality attributes, and the use of balanced scorecards is a well-accepted and reviewed measurement of team or organizational performance throughout industry and professional practice (Kaplan and Norton, 1996; Kaplan, Norton, and Rugelsjoen, 2010).

While not all of Pitcher and Smith's (1996) proposed explanations for non-findings can be completely dismissed in the present research, there is evidence indicating that this study was impaired by the poor measurement of team performance as the dependent variable. There are three interconnected reasons that the dependent variable in this study proved inadequate and unusable as an outcome measure of team performance.

First, the simulation's cumulative balanced scorecard results were constrained in that if a single team in a course section (known in this simulation as a universe) dominated in units sold or revenue, it placed an artificial ceiling on the amount that other remaining teams could sell. Therefore, if two high performing teams were in the same section and competitive universe, both teams' overall performance would be dampened by the presence and relative success of the other competitive team. However, if one of those specific two teams were instead in a less competitive section without a strong second competitive team, the balanced scorecard would reflect a higher relative degree of success.

Second, because of the interrelated nature of success and failure between teams in a single course section (competitive universe), balanced scorecard outcomes and their corresponding z-scores were not comparable across universes. This lack of comparability occurs because of the varying configurations of teams within each unique competitive universe. Thus, the balanced scorecard results were related *within* the sections/universes, but *not across* the sections/universes.

Frankly stated, the dependent variable at the research project level is regrettably seeking to compare unrelated points of data that cannot be compared across all 199 teams in any meaningful way. A dependent variable's purpose is to detect hypothesized changes due to the variation of stated independent variables (Burns and Burns, 1987). The observed dependent variable in this study fails that purpose. Unfortunately, there was no other measurement of project team performance collected.

To summarize this section, the dependent variable (the computer simulation's Balanced Scorecard calculation) chosen in the methods section and reported in the findings section failed to provide a meaningful project team outcome with which to investigate the hypotheses. Despite a lack of findings, valuable contributions to both research and science exist and are reported in the next section.

Contributions

Contributions to Research

This study heeds calls in previous GPC research for field studies rather than laboratory experiments (Halfhill et al., 2005) and for larger sample sizes (Prewett, Walvoord, Stilson, Rossi, and Brannick, 2009). Almost 800 respondents representing 199 project teams completed the survey for this research and had quantifiable group results. The teams worked together in a stressful results-driven environment and project team performance was measured across nine scorecard metrics combined into a single cumulative balanced scorecard metric.

Furthermore, several valuable lessons were gleaned from this research. First, a research plan should always prepare a second dependent variable that measures the same outcome phenomenon as the primary dependent variable. For example, in hindsight this project should

have pre-determined other quantitative measures from the simulation that meaningfully and accurately overarched performance by individual section. Second, another suggestion to future researchers in group personality composition is to also capture a qualitative measure (or multiple measures) for the dependent variables such as either group members' perception of team performance or with a faculty-led simulation, the instructor's perception of each teams' performance. While these are perhaps not the most desirable measures, their collection is critical in the event that the primary variable of interest is unusable for whatever reason. A third suggestion is to pretest data before launching a full-scale round of data collection. In the case of this project, beginning data collection with a pre-test during a summer semester would have allowed the opportunity for both pretest data collection and statistical analysis of the exploratory findings.

Contributions to Practice

As discussed in Chapter 1, a modern organization's ability to quickly craft effective problem-solving teams to solve problems is essential to its success and survival (The Economist, 2006). The managers responsible for these teams can benefit from this paper in two important ways. First, teams can be selected and formed using group personality composition as a significant factor in member selection and this organizational ability is increasing in value. Team hiring is becoming more popular as firms choose to hire all of the individuals entire teams simultaneously, attempting to keep the team intact and growing in skill together over time (Munyon, Summers, and Ferris, 2011). Secondly, when a team already exists and is operating, the directing manager also can utilize group personality composition to explain results that diverge from expectations, and then either advise team members as to which personality

configuration exists within their team and what the effects of their particular combination are, or evaluate the need to replace members to reform a different, effective work team.

Limitations

As in any research project, this study has limitations. This section discusses such concerns, including external validity, presence of mediators and moderators, and realism of business simulations.

External Validity

One possible limitation of this study is external validity, "the extent to which findings of a study are relevant to subjects and settings beyond those in the study" (Vogt, 1999). This shortcoming could take at least three forms in the present work.

First, using a student sample is of concern in modern management research and often raises red flags whether justified or not (Sears, 1986). Concerns exist that, when compared to the general population, college students are younger and possess greater cognitive ability, but conversely are also more compliant, less self-assured, and behave inconsistently (Sears, 1986).

Second, project teams are not necessarily indicative of teams in general or other specific types of teams. As noted by Hackman (1990), there are many different types of teams seeking to accomplish different arrays of goals and objectives.

Third, while the study's respondents accurately reflected the demographic configuration of the business students at the university, the majority was overly represented by North American (94.4%), white (84.8%), and male (64.4%) respondents. When considering the increase of demographic diversity in the American workforce, this study clearly has

underrepresented groups apparent in the analysis of the respondents based on international citizenship, race, and gender.

Mediator/Moderator Variables

Another limitation is the potential effects of mediator/moderator variables. An intermediary variable may attenuate, cloak, or overwhelm the relationship between independent variables such as group personality composition, and the variable(s) of interest, in this case team performance (Pitcher and Smith, 1996). Such potential mediator/moderators theorized in the GPC literature include patterns of workflow (Prewitt et al., 2009), design behavior (Peeters et al., 2008), team creative confidence (Baer et al., 2008), and general mental ability (Bell, 2007).

Realism of Business Simulations

Lastly, while business simulations can accurately reflect decision-making scenarios and offer numerous advantages as a platform for business research (Dickinson, Gentry, and Burns, 2004), such simulations often lack organizational context, especially the multiple-level hierarchies involved in most modern business firms (Keys and Wolfe, 1990).

Future Research

Team creation is a young and evolving science (Pentland, 2012). While results from this study are limited, a continued research agenda is advocated. This paper's original three research questions in Chapter 1 remain unfettered. First, does the group personality composition of a team affect its performance? Next, to what degree does each specific group personality trait predict team performance? Lastly, to what degree does group personality trait operationalization predict team performance? An obvious first step in future research is to revisit the nine hypotheses proposed in this research. A new dependent variable (or set of dependent variables),

free of constraints, can be identified, pretested, and them implemented. As mentioned previously, as a contingency, the team members' group perception about goal attainment, team effects on the individual, and the team's potential to continue operating in the future should also be captured (Hackman, 1987; Sundstrom et al., 1990).

Configurational Research

Establishing configurations via statistical cluster analysis might produce an effective vehicle to gain valuable insight and is a popular methodology in management (Ketchen and Shook, 1996) and a major technique for classifying "mountains" of information into meaningful configurations (Burns and Burns, 2008). Building upon Miller and Mintzberg's configuration work in organizational research (1983), future projects should investigate configurations in group personality composition relative to team performance. For example, previous research suggests that increases in either team conscientiousness, team extraversion or team agreeableness (and possibly their interactions) are associated with increases in team performance. Cluster analysis is important in all scientific fields as researchers need to make and revise classifications continually, leading to noteworthy research questions that often incite new and valuable research (Romesburg, 1984). One such intriguing research question would center on the clustering of team types by group personality composition, and the subsequent possible relationship to team performance. Is there a natural configuration of teams based on the presence or absence of team conscientiousness, team extraversion or team agreeableness? This question might begin a new stream of valuable research offering new insight into team formation and management.

Team Process Research

Huff and Reger (1987) called for more management research simultaneously considering both content and process of strategy. GPC research is well positioned to investigate *how* project

teams make decisions, as well as *what* strategic decisions are made and their consequences. In particular, the next steps in this research are to consider how different process variables that lie between project team group personality in project teams and the results actually achieved. Two variables in particular seem ripe for consideration in a project team context: team cohesion and team conflict.

Cohesion

Cohesion is the process by which a group or team of individuals exhibits a tendency to stick together and continually pursue unified and shared goals and objectives (Cota et al., 1995). Cohesion has been linked to team and small group performance outcomes (Beal, Cohen, Burke, and McLendon, 2003).

Conflict

On the other hand, conflict is defined as awareness within the team that discrepancies of some kind exist with that group, either in terms of incompatibles wishes or desires. Furthermore, while emotional (affective) conflict is negatively related to team performance and satisfaction (Jehn, 1994), task conflict (substantive) is positively related to team performance under certain circumstances (Bradley, Klotz, Postlethwaite, and Brown, 2012)

Both cohesion and conflict are moderating processes impacting the relationship between group personality composition variables and team performance (Cota et al., 1995). This next step in research could provide interesting insights for both managers and researchers, offering understanding into the internal processes positioned between small team attributes and outcomes (Cohen and Bailey, 1997).

Mixed Methods Research

Field study of project teams is an opportunity for simultaneously utilizing both qualitative and qualitative methods. This type of mixed methods research design can yield rich yet

generalizable results (Creswell and Clark, 2007). I would like to use a similar online survey approach as the current paper, but also meet with faculty that are directly coaching the teams to gather their evaluation on specific team performance as the simulation progresses. Furthermore, team members could also make brief weekly entries into a team log detailing their interactions and those entries can be analyzed though content analysis and related to both group personality composition and team performance.

Conclusions

This research project set out to scrutinize the relationship between different group personality compositions and project team performance, and suggest possible explanations for those relationships. The project is firmly built on the previous GPC literature. 787 respondents fully completed the seventy-seven item Qualtrics-based online survey during four academic semesters spanning an eighteen-month period. While previous research has linked team performance with group personality composition measures for conscientiousness, agreeableness, extraversion, emotional stability, and openness to experience (Peeters, Rutte, Tuijl, and Reymen, 2008; Bell, 2007), due to methodological problems this study was unable to confirm similar relationships with project team outcomes.

The notion that group personality composition predicts team performance remains tenable and deserves further research efforts. This study provides a solid foundation leading to exciting future research. These future studies can leverage the GPC configurations while considering both cohesion and conflict as process variables, leading to deeper understanding of the conditions and dynamics necessary for project team success.

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APPENDICES

APPENDIX A – Simulation Course Syllabus

Business Administration 353
Integrated Process Management Spring 20XX

The overall objective of this course is to develop your professional business skills. Through computer simulation, we will place you into a very realistic international business setting where you will run a company for two years in compressed time (eight rounds of decision making). You will work closely with a team of fellow students to manage a highly complex and integrated business. Personal leadership and strong interpersonal skills will be necessary to succeed.

Throughout the exercise, you will receive guidance and feedback from a professional coach. The coach's job is to challenge your business thinking and help you to become a good team player and business manager.

Learning Objectives

This course will employ the *Marketplace* simulation as a learning environment. The exercise is a transformational experience. You will learn what it's like to compete in the fast-paced, competitive market where customers are demanding and the competition is working hard to take away your business.

In the *Marketplace*, you start up and run your own company, struggling with business fundamentals and the interplay between marketing, human resources, operations, finance, and accounting. You are given control of a simulated business and must manage its operations through several decision cycles. Repeatedly, you must analyze the situation, plan a business strategy to improve it and then execute that strategy out into the future. You face great uncertainty from the outside environment and from your own decisions. Incrementally, you learn to skillfully adjust your strategy as you discover the nature of your real-life decisions, including the available options, linkages to other parts of the business, conflicts, tradeoffs and potential outcomes.

Here is a list of the specific tasks that *Marketplace* players do:

- Analyze market research data;
- Plan and roll out a marketing campaign;
- Design brands to appeal to different market segments;
- Devise advertising campaigns, sales force incentives, and price option;
- Allocate scarce funds to RandD, manufacturing, quality, advertising, and distribution;
- Select and prioritize RandD projects, leading to new product features;
- Negotiate strategic partnerships with competitors for new technology;
- Initiate and defend lawsuits over false advertising;
- Hire employees and set competitive compensation packages;
- Schedule production and manage plant capacity;
- Initiate quality production programs;
- Manage cash;
- Negotiate equity and debt financing for new business development;
- Compete head-to-head with other business teams;
- Adjust strategy and tactics in response to financial performance, competitive tactics, and customer needs.

The specific goal of the simulation exercise is to develop your management skills by giving you an integrated perspective of the entire business operation. In terms of specifics, the exercise can:

- Develop strategic planning and execution skills within a rapidly changing environment.
- Crystallize the linkages between business decisions and financial performance.
- Instill a bottom line focus and the simultaneous need to deliver customer value.
- Internalize how important it is to use market data and competitive signals to adjust the strategic plan and more tightly focus business tactics.
- Promote better decision making by helping you see how your decisions can affect the performance of others and organization as a whole.
- Facilitate learning of important business concepts, principles and ways of thinking
- Experience the challenges and rewards of the entrepreneur by starting up and running a new business venture
- Build confidence through knowledge and experience.

To accomplish all of this, it will be necessary to forge a strong team that can effectively manage many tasks in concert. Leadership, teamwork and interpersonal skills will be part-and-parcel of what it takes to succeed. Your team will serve as a live case study within which you can develop your personal style of working with others. You will deal such issues as the selection of professional colleagues, working with diversity, organization of work, decision-making processes, conflict management, performance appraisal, and culture.

Organization of the Exercise

Table 1 contains a chronological listing of selected simulation activities that you and a team of fellow students will encounter while competing in this exercise. Each quarter or decision period has a dominant activity and a set of decisions that are linked to it. These dominant activities take the team through the business life cycle from start-up, to development, to growth, to near maturity. As you work through the business life cycle, we will phase in the disciplinary material as it becomes relevant to the current decisions of the team. Thus, the delivery of the learning material is not organized by discipline, rather by its relationship to decisions being faced by your firm.

Each quarter's activities not only result in new material being introduced, but also build upon the prior content so that there is considerable repetition. We have found that business activities such as leadership, team management, pro forma cash flow analysis, value creation in product design, demand-based production scheduling, activity-based costing, and strategic planning and management are not easily absorbed. They require repetitive exercise in order to set them into the natural thinking of the students.

For each new decision, there is reading material in the accompanying textbook, *The Management of Strategy in the Marketplace,* which lays out the nature of the decision being faced, the issues to be dealt with, its linkages with other decisions, and the tradeoffs to be considered. The chapters are laid out according to the normal process of starting, growing, and maturing a business.

Team Effort

You will team up with three or four other students to form an entrepreneurial firm that will compete in a "business strategy game." During a twelve-week period, you will take your fledgling business through the natural stages of business growth, including emergence, development, and maturity. Along the way, you will learn to develop and refine your strategies and tactics.

Virtual Teams

The virtual firm is fast becoming a reality. When you take your job after graduation, you may work out of your home in Dallas, confer with your management team in London, coordinate shipments from the factory in Shanghai, all to service the customer in Montreal. You will use cell phones, email, instant messaging, the World Wide Web and video conferencing to communicate with everyone up and down the supply chain.

To help you learn to work within a virtual organization, the *Marketplace* exercise will be delivered over the Internet. In logistical terms, we will create a common data set for the team's decisions and store it on an Internet accessible file server. Thus, your team will be able to work from any location where there is a PC with an Internet connection.

Any member of the team will be able to log onto the server, review the current situation on the web, make decisions, and then save them for the next student to work on. As each team member completes his or her area of responsibility, he or she will report the analysis and decisions to the rest of the team for their consideration.

You and your team will still need to confer on your analysis, strategy and tactics. The advantage of this Internet system is that each team member will be able to work on the most up-to-date decision file so that everyone is looking at the same data set.

The file server setup will also facilitate the coaching role of the instructor. Just like you, the instructor will be able to log on at any time to review the current situation with any team or the exercise as a whole. Thus, the instructor can monitor activity and results and adjust the content of any discussion groups or individual coaching efforts.

Required Texts and Software

Cadotte, Ernest R. and Harry J. Bruce; *The Management of Strategy in the Marketplace*, Innovative Learning Solutions, 2009

An electronic textbook will be used this semester in order to reduce the price paid and to save trees. The cost of the textbook will be added to the cost of the Marketplace Live software. You will be able to access the textbook chapters through the *Marketplace Live* software via a textbook icon at the top of the screen. Each chapter is a PDF file that you can download to your computer. It is formatted so that you can write on it and underline material just like a normal book.

The simulation that will be used in this course is entitled *Strategic Corporate Management - Live Edition (*2011) by Ernest R. Cadotte. It is available through Innovative Learning Solutions, Inc.

Your software license can be purchased online with a credit card at https://web.marketplace-simulation.com/home/purchase/purchase.php. You will not be able to purchase the license until after your team has been formed a couple of weeks into the course.

Software Demos and Signup Procedures

A flash demo has been prepared to introduce you to the *Marketplace* software. Please go to the following web page to review the *Strategic Corporate Management simulation*: http://www.marketplace-live.com/demo/demo-scm.html

Prerequisites: Undergraduate core.

Business Plan	25 points
Final Team Presentation	10 points
Team Simulation Performance *A cumulative balanced scorecard for quarters 5 through 8 will be used to judge the success of each firm. A team's grade will be determined by its relative ranking on the CBS compared to the other firms in its industry.*	15points
Ownership of Balanced Scorecard *Every executive must take responsibility for two of the performance criteria that make up the balanced scorecard. Each person's evaluation will be determined by how well the firm does in the selected areas in comparison to individuals in different companies that have similar responsibilities.*	2points
Online Assurance of Learning Assessment *The Assurance of Learning Assessment is designed to test 1) your knowledge of your business in terms of marketing, manufacturing, human resource, financial and accounting information, 2) your ability to use the tools of management to understand your current position in the market, and 3) your ability to develop an integrative perspective of your business.*	5 points
Executive Briefing Contribution *Every executive must demonstrate mastery of the information and decisions within his/her areas of responsibility plus integrate his/her responsibilities with the rest of the organization so as to maximize its total performance.*	20 points
Individual Quiz Average *A quiz will accompany every lecture. The two lowest quiz grades will be dropped.* ***(NOTE: Students are responsible to purchase and bring a scantron to every Monday lecture.)***	20points
Peer Evaluation *Everyone on the team must do his/her share of the work. And, good interpersonal skills are necessary to keep the team moving in a positive direction. To judge the contribution of each team member, three (3) peer evaluations will be administered. A peer evaluation score of 4.0 or higher will earn 1 point. A score of less than 4.0 will result in the loss of points. Up to 6 points can be lost for each peer evaluation.*	3points

Grade	Ranges	GP	Grading Guidelines
A	=/> 92%	4.0	Superior performance in all aspects. Exemplifies highest quality work.
A-	90.0-91.99	3.7	Outstanding. Superior performance in most aspects.
B+	88-89.99%	3.3	Superior performance in many aspects. Very High quality work.
B	82-87.99%	3.0	High quality performance in all or most aspects.
B-	80.0-81.99	2.7	High quality performance in many aspects. Better than average.
C+	78-79.99%	2.3	High quality performance in some aspects; Above average.
C	72-77.99%	2.0	Satisfactory performance. Average.
C-	70.0-71.99	1.7	Unsatisfactory
D+	68.0-69.99	1.3	Unsatisfactory
D	62-67.99%	1.0	Unsatisfactory
D-	60.0-61.99	.7	Unsatisfactory
F	< 60%	0	Failure.

Business Plan and Report to Board

Each team will deliver an oral presentation for the Business Plan and the Report to the Board of Directors. The team will be expected to make a "professional" presentation using an assortment of visual aids. Moreover, the details of the market analyses and strategy must be carefully laid out in appropriate handouts. There is no written Business Plan or Report to the Board. The dress code is business professional.

Guidelines for the preparation of the business plan and final report are attached. Rubrics that explain the evaluation process will be posted on Blackboard in advance.

Computation of Simulation Performance

A Balanced Scorecard will be used to measure your firm's performance. The team's total business performance will be based upon its financial performance, market effectiveness, marketing performance, investments in the firm's future, manufacturing productivity, asset management, creation of wealth and financial risk. A total score will be computed for each firm competing in the *Marketplace*.

At the end of the exercise, each team will be ranked in the order of performance for the total score. A letter grade will be assigned depending upon your team's ranking and how close it is to the team(s) above or below it. The rubric for assigning the letter grade will also be posted on Blackboard.

Role on the Executive Team

Management of your entrepreneurial firm will be a challenging task. Successful firms divide up the responsibility and share the workload. You will need to take on one of the following roles:

1) VP Marketing
2) VP Sales Management
3) VP Marketing Research
4) VP Manufacturing, and
5) VP Finance and Accounting.

One of our goals is to develop management skills of all the students. For this reason everyone will also take on the responsibility of managing the team and serve for a period of time as the president of the company. The president's job is to manage the schedules and meetings, oversee the assignment of tasks, monitor overall performance (balanced scorecard) and help the team in every way possible to achieve a strong business performance.

The president's position will be rotated among the team members. The first person will organize the formation phase of the business (Quarters 1 and 2), including 1) the selection of team members, 2) deliberations regarding team norms, decision-making process and roles and 3), and formulation of the team's initial business strategy. The second person will organize the test market phase (Quarters 3 and 4). The major focus of this phase is the implementation and refinement of the firm's initial strategy. The third person will oversee the preparation of the business plan and its presentation to the outside investors (Quarter 5). The fourth person will manage the implementation of the business plan (Quarters 6 to 8). And, the fifth person will organize the final presentation to the Board of Directors. If there are only four people on the team, then the last two activities can be merged into one.

The rotation of president should be decided during the first phase of the company. However, this rotation can be changed at any time.

After each person has completed his or her tour as President, the rest of the team will provide feedback on his or her performance in that role.

Team Formation

Early in the semester, you will prepare a resume to apply for one of the executive positions in the new firm. You will present yourself to the class and highlight why you are a good candidate for the position you would like to fill.

The teams will be formed via a sports-type draft. The class will be divided into 5 groups of 5 students. One group will be selected at random to serve as the first president. On the day of team selection, the presidents will step into the hallway and review the resumes of the first group of students. Each president will pick the first team member from this group. The order of picking will be random.

The presidents will return to the class and notify the person who is now on his/her team. The two will then review the resumes of the second group together. The presidents will step into the hall and pick the second person to be added to the team. The order of picking will be random. This procedure will continue until everyone has been picked and the teams formed.

Executive Briefings

The Chairperson of the Board (Business Coach) will meet periodically with each team for up to 25 minutes. There will be one executive briefing for seven of the 8 quarters of play. During these executive briefings, the team will review its:

1) performance during the prior quarter
2) market analysis
3) strategy for current quarter and going forward
4) current decisions, and
5) pro forma financial projections for current quarter.

To help organize the executive briefings, it is to be led by the President and a written agenda must be provided to the Chairperson of the Board. Furthermore, the agenda should contain each topic to be addressed, the person responsible for it and the amount of time to be devoted to it. And, there should leave at least 5 minutes for questions and answers.

Finally, each and every student must be prepared to defend the analysis and the logic behind all of the team's decisions and plans.

Individual Effort

Your performance evaluation will be based upon your team's performance on the business plan, report to the board and overall simulation. In addition, you will have personal responsibility for the executive briefings, two performance criteria in the balanced scorecard, and the weekly quizzes.

Executive Briefings. You must participate in all Executive Briefings. Your individual effort grade will be based primarily upon the Business Coach's evaluation of your contribution during these Executive Briefings.

The executive briefings will be your opportunity to demonstrate your mastery of the information and decisions within your areas of responsibility and how you have integrated your decisions within the framework of the entire firm. Each week, the Business Coach will evaluate this mastery using a standardized rubric and post the evaluation on Blackboard. The rubric will be reviewed by the Business Coach during the session when the teams are formed. It will also be placed on Blackboard at the same time.

Ownership of Balanced Scorecard. As noted above, you will take on one of the vice-presidential roles within the firm. To insure that you see the link between your decisions and the balanced scorecard, you will be asked to take ownership of two of the performance criteria that make up the scorecard. At the end of the exercise, part of your individual evaluation will be judged by how well your firm performed on these criteria compared to the performance of other firms in your industry. Based upon your ranking, you will receive the following number of points: 1st = 2 pts, 2nd = 1.5 pts, 3rd = 1 pt, 4th = .5 pts, and 5th = 0 points. You final score will be an average of your scores on each criteria that you took ownership of.

Quizzes. The textbook, *The Management of Strategy in the Marketplace*, provides many of the concepts, tools and ways of thinking that you will need to successfully manage your firm. The chapters are staged over the length of the course to provide the needed managerial guidance as the firm progresses through its lifecycle.

Similarly, lectures are very important to your training and participation in the simulation exercise. The content of these lectures should enable you to make better business decisions, be a better competitor in the business simulation, and, in general, be a good contributor to the team.

To encourage your reading of the chapters and attendance at lectures, **a quiz will be administered during each lecture**. Each quiz will be administered once and only once; a student missing the quiz "may not make it up". The two lowest or missing quiz grades will be dropped.

On the quiz scan forms, you must write in your section number and bubble it in under special code section. You must also write and bubble in your name. Failure to do either will result in a 50% reduction in your quiz score that week.

You must attend your scheduled lecture on quiz days. If you don't attend your assigned lecture, your quiz score will be zero.

Attendance at Lectures and Executive Briefings

The executive briefings and lectures are core to the learning experience of this course; thus a**ttendance is mandatory**. Failure to attend an executive briefing without a documented valid excuse will cause the total **course grade to be reduced by 5 points for each meeting missed.** Both the team and instructor must be provided with the documented valid excuse in advance, unless circumstances do not allow it.

Since your two lowest quiz grades will be dropped, this means that you can miss up to two lectures without penalty. It also means that there are no excused absences. If you have to miss class due to a job interview, sickness, or a personal need, it will be taken care of via the dropped quiz feature. You do not have to request permission and none will be given.

The third and subsequent missed classes will result in the loss of 6 points for each occurrence from your total quiz score, no excuses. **Furthermore, your total course grade will be reduced by 5 points if you miss more than four (4) lectures. If you miss more than six (6) lectures, your total course grade will be reduced by 10 points.**

Peer Evaluations

This course is heavily dependent upon good teamwork and interpersonal skills. Therefore, three peer evaluations are to be completed throughout the semester. A peer evaluation will be conducted at the end of the 4thquarter of play, after completion of the Business Plan and after the Report to the Board. The average of Parts I and II will be used to determine the assignment of points for the first two peer evaluations and Part V will be used for the third peer evaluation.

You can earn 1 point by achieving at least a 4.0 on each peer evaluation. A peer evaluation score that is less than the minimum of 4.0 would suggest that you are not doing your share of the work or that your interpersonal skills are lacking. Points will be lost under these circumstances. It is possible to lose up to 6 points on each peer evaluation. In total, there are a total of 18 points at risk. Here is how the peer evaluation score will be converted to points earned or lost:

Average Score on Peer Evaluation	Points Earned or Lost
4.0 or greater	+1.0
3.75 to 3.99	0.0
3.5 to 3.74	-1.0
3.25 to 3.49	-2.0
3.0 to 3.24	-3.0
Less than 3.0	-4.0

As you can see, these peer evaluations are very important. If your peers do not believe you are contributing to the team effort, your final grade will be reduced. Failure to complete a peer evaluation by the deadline will result in a loss of two points from your total peer evaluation score.

You Can Be Fired

It is permissible to fire a team member who is not making a substantive contribution to the success of the team. Missed meetings, poor preparation, failure to complete assignments, etc. are all indicative of underperformance. Before a person can be fired, the team must give the student an opportunity to correct his or her deficiencies.

In terms of protocol, the team must provide the student with a written statement of the problems associated with his or her work. A peer evaluation may be used in conjunction with this statement.

When an individual receives a poor performance report, the student must respond in writing as to how he or she will correct the problems cited. If the problems continue, the team may fire the underperforming team member with a letter of dismissal. A copy of all correspondence must be submitted to the instructor for approval.

A person who is fired will be assigned to compete in another simulation where the student is responsible for all the firm's activities, including weekly decisions and executive briefings and the preparation of a Business Plan and Report to the Board. This new simulation will begin in Quarter 1 and continue through the quarter 8.

Being fired will also limit the student's maximum potential grade by one-and-half letter grades. Specifically, 15 points will be deducted from the student's final point score for all completed assignments. Thus, if the student earned a final score of 90 out of 100 points, then the adjusted final score would be 75 points. The final grade would be based upon the adjusted final score.

The same conditions will be applied if a person quits a team.

Odds and Ends

Company Blog. A company blog is available through *Marketplace Live*. It is intended to communicate your professional stature to the rest of the industry. Required materials include a team picture, a recent picture of each team member and a company logo. These items should be posted to the blog prior to the first Executive Briefing and are the responsibility of the first president. You are free to add other materials as needed or desired, so long as they meet the professional standards of the University.

Questions to the Business Coach. The help files in the software contain all of the directions you will need to participate in the strategic business simulation. Nonetheless, there is a tendency for students to ask the Business coach for help rather than look in the help files. With the number of students currently playing the game, it can become a very large burden. For this reason, the instructor/coach will charge $10,000 to answer any question already addressed in software.

Workload. The first part of the course requires a normal workload for any reading and lecture course. Once the simulation begins, the work will vary according to the activities within the exercise. During the first quarter of play, the work is fairly light. However, it will increase each week up through the presentation of the Business Plan. Students report spending three to four hours per week during quarters three and four and 8 to 10 hours per week during the preparation of the Business Plan.

Following acceptance of the business plan, the majority of students report spending two to three hours per week. This reduction of time is due to familiarity with the software, game procedures, and market, and having a plan of action that requires modification rather than creation.

The format of the course eliminates more than half of the lectures and replaces them with independent work and executive briefings. If one assumes that a normal workload for an upper division course is equal to 6 hours per week (two hours in class plus four hours of study out of class), then the workload is not unreasonable. It may seem greater because it tends to be captivating. You will find yourself thinking about it at odd times, i.e., driving to class, in the shower, or out on a date.

Time Management. Time management will be vital to your success in participating in the business simulation. There is more work than any one person can do. Also, it is not wise for everyone to participate in all aspects of the business. Too much time would be wasted. Therefore, it is necessary to divide up the work. There are suggestions on how to divide up the responsibility in the help files within the software. Feel free to depart from these guidelines if individual preferences, experiences, or workloads would allow a more equitable allocation of tasks. Also, do not hesitate to reallocate responsibility if conflicts arise or the workload is unevenly distributed.

The president should preside over each executive meeting, making sure that the discussion does not wander from the business at hand. Each team meeting should begin with an agenda and a timetable. Meetings should not last more than two hours. Long drawn out meetings are not productive and raise frustration levels about not getting things done. The meeting should conclude with a set of action items for each executive. The outcome of these actions should be reviewed at the start of the next meeting.

To facilitate executive meetings, each team member should prepare his/her work in advance. The executive should know the ins and outs, problems, and tradeoffs of his/her area of responsibility. When the executive committee meets as a whole, each executive should have a plan of action to recommend to the team. The executive should be prepared to thoroughly discuss the options open to the company and be flexible on the final decision of the executive team.

Academic and Professional Integrity. Professionalism implies a respect and courtesy for others in our classroom setting and chosen business profession. We expect our students to maintain the highest standards of professionalism in the classroom, in group and team settings, in the greater university community, and in related public settings. All that you do and say, and the way you present yourself visually either elevates or diminishes your professional image in the eyes of others
Furthermore, each student is responsible for abiding by the policies and honor code set forth in the rules regarding academic integrity. Cheating of any sort including plagiarism will not be tolerated and will result in either a grade of F for the assignment/exam or a grade of F for the course (at the instructor's discretion) and a charge of academic dishonesty against the student(s). It is recognized that any student has the right to appeal a grading decision of an instructor and/or penalties resulting from a charge of academic dishonesty.

Honor code statement. "As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

Inclement Weather Policy. The University of X, will remain open except in the most severe weather conditions. The chancellor (or appointed representative) may officially close or suspend selected activities of the university because of extreme weather conditions. When a decision to close is reached, campus and local radio and TV stations will be notified and the notice will be posted on the front page.
In the event of a delayed opening, the chancellor (or appointed representative) will determine a specific time of opening and that information will be distributed to the campus community through the local media and via the front page. All faculty and staff are expected to report to their specific work location by the set opening time. Students are expected to report to their regularly scheduled class only if there are 30 or more minutes remaining in the session.

Disability Statement. If you need course adaptations or accommodations because of a documented disability or if you have emergency information to share, please contact the Office of Disability Services at the beginning of the semester. This will ensure that you are properly registered for services.

Sequence of Simulation Activities

Quarter 1: Organize team to do the job

Focus on process of working as a team to achieve goals
- assess team members' skills, personalities, and work styles
- set organizational and personal goals
- organize the work
- determine how to manage the organization
- establish leadership

Quarter 2: Evaluate market opportunities, setup operations and prepare for test market

Analyze market opportunities -- evaluate segments, geographic markets and potential competition
Select target segments
Create customer value -- design initial brands for test market
- match components to benefits desired (quality function deployment (QFD))
- evaluate impact of different components on changeover costs and scale economies

Setup manufacturing operations -- evaluate financial tradeoffs
- compare regional cost differences of labor and distribution on plant location
- evaluate economy and liquidity of different capacity investments

Select test markets -- setup sales offices

Quarter 3: Go to market to test strategy and market assumptions

Marketing strategy -- evaluate tactical options and choose marketing mix
- pricing and price promotions
- sales force management - number employed, training, incentives
- advertising -- ad copy design, media selection, ad frequency

Manufacturing -- plan production and inventory levels
- forecast demand by brand
- set 65-day production schedule

Market research -- budget collection of information

Quarter 4: Evaluate test market performance and revise strategy, become a learning organization

Evaluate performance
- financial performance -- financial statements, ratios, industry norms
- market performance -- customer opinion of brand designs, prices, advertising, sales force
- competitor tactics -- segments targeted, selection of marketing tactics

Revise marketing and manufacturing tactics as needed and continue test marketing

Quarter 5: Seek external funding -- prepare business plan, negotiate equity investment

Evaluate performance - financial, marketing, and competitive
Develop two year business plan
- goals - marketing, financial and ownership
- marketing strategy
- manufacturing strategy
- financial strategy
- tactical pert chart (show tactics over time)
- pro forma cash flows and financial statements
- size of equity request, number of shares offered and share price

Present business plan to venture capitalists and negotiate equity investment
Begin roll out of business plan

Quarter 6: Monitor, improve and execute

Evaluate team - self assessment of roles played, contributions made, and adjustments needed
Evaluate performance - financial, marketing, and competitive
Skillfully adjust strategy
- marketing -- make incremental changes in tactics
  - use activity based costing (ABC) to evaluate profitability of brands, sales outlets
  - conduct demand analysis to estimate brand, price, advertising, sales force elasticities
  - invest in RandD for new technology
- manufacturing -- work on
  - quality improvements with statistical process control (SPC)
  - demand-- driven production scheduling
  - capacity utilization by reducing changeover time and costs
  - reducing pipeline whiplash by managing market stimulation activities
- project cash flows and adjust strategy within financial capability

Quarters 7 - 8: Monitor, improve and execute (continue)

Manage strategy
- skillfully adjust strategy to unanticipated competitive moves
- continuously improve brand features (RandD), pricing, promotions, distribution, compensation package, product quality, production efficiency, and asset management
- project cash flows and adjust strategy within financial capability

Outline for the Business Plan

Format: Presentation: 15 Minutes - use Power Point Questions: 5 Minutes

This is NOT a written document.

Participation: Everyone should have a role in the presentation and QandA

The Business Plan presentation should include the following components:

1. Executive Summary

2. Review of financial and market performance during the past year

3. Assessment of current situation and the market
   A. Customers
   B. Competition
   C. Company's strengths and weaknesses
   D. Major problems/opportunities to be dealt with in next year

4. Strategy for the next year in business (What will it take to get ahead or stay ahead?)
   A. Marketing Strategy
   B. Manufacturing Strategy
   C. Sales Channel Strategy
   D. Human Resource Strategy
   E. Financial Strategy

5. Financial request
   A. Amount of money being sought
   B. Projected ROI at end of year two
   C. Desired stock price and share of company being offered

6. *Pro forma* cash flow, balance sheet and income statement (Quarter 1 to 8)

7. Tactical plan (Quarters 1 to 8)

The communication style should emphasize objectivity and candor.
Dress code is business professional.
Report to Board

Format: Presentation: 15 Minutes - use Power Point. Questions: 5 Minutes

Participation: Everyone should have a role in the presentation and QandA

The Report to the Board should include the following components:

1. Executive Summary

2. Review your financial, market, operational and HR performance during the second year

3. Highlight the key features of the business plan which was presented to the venture capitalist
   A. Marketing strategy
   B. Sales Channel
   C. Human Resource strategy
   D. Manufacturing strategy
   E. Financial strategy

4. Assess your business strategy and performance during the second year (This section can be done simultaneously with Section 2 above.)
   A. Compare actions taken against the business plan
   B. Discuss departures from the business plan and justification
   C. Review significant events that affected the company and/or market
   D. Review goals relative to performance for key performance indicators (include the promises made relative to demand, revenue, net income, ROI, etc.)

5. Explain why you were able to achieve or not achieve your goals – what were the causes of your better or weaker than expected performance? (candidness here is very important)

6. Summarize how you have prepared your firm to compete in the future.

7. What were the lessons learned?
   A. How did you benefit from participating in the simulation?
   B. Are there any lessons that you can take into the business world

The communication style should emphasize objectivity and candor.
Dress code is business professional.

	January 14 Introduction to course and expectations Directions for next class on leadership and preparing resume and presenting it for an executive position.
January 17 No class – MLK Holiday	January 21 First half - Leadership and Teamwork discussion. Quiz on Chapters 1 and 2 Second Half - Give two-minute presentation on the executive position you are seeking and why you will be good at it. Bring a copy of your resume for everyone in class, plus the Coach.
January 24 Overview Read Overview Ch. (pp. 1-13)	January 28 Team Formation exercise Review Executive Briefing requirements
January 31 Strategic Planning Quiz and Lecture on Ch. 3 and 4	February 4 Q1 Executive Briefing and Decisions
February 7 The Response Function in Brand Design Quiz on Chapter 7 and pages 148 to 158 in Chapter 6	February 11 Q2 Executive Briefing and Decisions
February 14 Tactical Considerations in Designing Marketing Strategies Quiz on Chapters 5 and 6	February 18 Q3 Executive Briefing and Decisions
February 21 Review Q3 results and discuss Lean Manufacturing and Quality Improvement Quiz on Chapter 13 and 14	February 25 Q4 Executive Briefing and Decisions Peer Evaluation 1 begins after briefings and ends at 5:00 pm on March 1.

February 28 Obtaining Venture Capital by Writing and Presenting a Business Plan Quiz and Lecture on Ch. 9 and10	March 4 Q5 Executive Briefings
March 7 Managing the Team to Excellence Quiz on Chapter 12	March 11 Review of Tactical Plan and Pro Formas Tactical Plan and Pro Formas are due by 3:00 pm. on Wednesday, March 9. **Failure to submit materials on time will result in a loss of 5 points.**
March 14 Spring Break	March 18 Spring Break
March 21 Financial Reporting, Profit Management and Valuation of the Firm Quiz Ch. 8	March 25 Business Plan Presentations. Business Plan slides are due by noon on March 23. Peer Evaluation 2 begins after Business Plan Presentations and is due by 5:00 pm on March 29th. Q5 Decisions are due by 10:00 am March 26th.
March 28 Working on the Margin to Improve Performance Quiz on Chapter 15	April 1 Q6 No Executive Briefing Entire lab will meet to take the Assurance of Learning Test **Laptop computers required.** Teams to meet with Coaches to Review Presentation Performance
April 4 Burnout and Quiz on Burnout (no reading)	April 8 Q7 Executive Briefing and Decisions
April 11 Video and Quiz on Stereotyping (no reading)	April 15 Q8 Executive Briefing and Decisions
April 18 Corporate Governance Quiz and Lecture on Ch. 11	April 22 Spring Recess
April 25 Managing Human Capital in Startup Firms Quiz and Lecture on Ch. 17 Wrap Up and Course Evaluation	April 29 Report to Board Presentation Report to Board slides are due by noon on April 27 Peer Evaluation 3 begins after Report presentations and is due by 5:00 pm May 3rd

APPENDIX B – International Personality Item Pool (IPIP) Scales

(-) reflects that reverse coding is required for that item (Goldberg, 1992).

Coding Item #	1. Extroversion	Survey Item #
E1	Am the life of the party.	1
E2	Don't talk a lot. (-)	6
E3	Feel comfortable around people.	11
E4	Keep in the background. (-)	16
E5	Start conversations.	21
E6	Have little to say. (-)	26
E7	Talk to a lot of different people at parties.	31
E8	Don't like to draw attention to myself. (-)	36
E9	Don't mind being the center of attention.	41
E10	Am quiet around strangers. (-)	46
	2. Agreeableness	
A1	Feel little concern for others. (-)	2
A2	Am interested in people.	7
A3	Insult people. (-)	12
A4	Sympathize with others' feelings.	17
A5	Am not interested in other people's problems. (-)	22
A6	Have a soft heart.	27
A7	Am not really interested in others. (-)	32
A8	Take time out for others.	37
A9	Feel others' emotions.	42
A10	Make people feel at ease.	47
	3. Conscientiousness	
C1	Am always prepared.	3
C2	Leave my belongings around. (-)	8
C3	Pay attention to details.	13
C4	Make a mess of things. (-)	18
C5	Get chores done right away.	23
C6	Often forget to put things back in their proper place. (-)	28
C7	Like order.	33
C8	Shirk my duties. (-)	38
C9	Follow a schedule.	43
C10	Am exacting in my work.	48

Coding Item #	4. Emotional Stability	Survey Item #
S1	Get stressed out easily. (-)	4
S2	Am relaxed most of the time.	9
S3	Worry about things. (-)	14
S4	Seldom feel blue.	19
S5	Am easily disturbed. (-)	24
S6	Get upset easily. (-)	29
S7	Change my mood a lot. (-)	34
S8	Have frequent mood swings. (-)	39
S9	Get irritated easily. (-)	44
S10	Often feel blue. (-)	49
	5. Openness to Experience	
O1	Have a rich vocabulary.	5
O2	Have difficulty understanding abstract ideas. (-)	10
O3	Have a vivid imagination.	15
O4	Am not interested in abstract ideas. (-)	20
O5	Have excellent ideas.	25
O6	Do not have a good imagination. (-)	30
O7	Am quick to understand things.	35
O8	Use difficult words.	40
O9	Spend time reflecting on things.	45
O10	Am full of ideas.	50

APPENDIX C – Calculation of the Cumulative Balanced Scorecard Index

BALANCED SCORECARD

Total Performance

The total business performance indicator is a quantitative measure of the executive team's ability to effectively manage the resources of the firm (Cadotte, 2012).

The total business performance measure is calculated by multiplying together nine indicators of business performance. The factors are financial performance, market performance, marketing effectiveness, investment in future, wealth, human resource management, asset management, manufacturing productivity, and financial risk. Each metric is defined below followed by its formula.

1. Financial performance measures how well the executive team has been able to create profits for its shareholders.
Financial performance = Net Profit from Current Operations / Total Shares Issued

2. Market performance measures how well the managers are able to create demand in their primary and secondary target segments.
Market performance = Average market share in targeted segments / 100 * Percent of demand actually served / 100

3. Marketing effectiveness measure of how well the managers have been able to satisfy the needs of the customers as measured by the quality of their brands and ads.
Marketing effectiveness = [Average brand judgment / 100 + Average ad judgment / 100] / 2

4. Investments in the firm's future reveals the willingness of the group to spend current revenues on future business opportunities.
Investments in the firm's future = (Current expenditures that benefit firms future / Net revenues) * 10 (+ 1)

5. Wealth is measures how effectively the executive team has been able to add wealth to the initial investments of the stockholders.
Creation of wealth = Net equity / Total stockholders equity

6. Human resource management measures how well the executive team is able to recruit the best employees, satisfy their needs and motivate them to excel.
Human resource management = (Sales force productivity / 100 + Factory worker productivity / 100) / 2

7. Asset management is a measures of the team's ability to use the firm's assets to create sales revenue.
Asset management = Asset turnover * Penalty for excess inventory

8. Manufacturing productivity measures the executive team's ability to efficiently create reliable products.
Manufacturing productivity = (Reliability Judgment /100) * (Percent of Operating Capacity Used in Production / 100)

9. Financial risk measures the executive team's ability to manage debt as a financial resource.
Financial risk = the amount of equity in the firm / the amount of capital invested in the firm from all sources.

The cumulative balanced scorecard is computed by multiplying the cumulative factors for the last four quarters of simulation described above together.

APPENDIX D – Hierarchical Regression Analysis Results by Hypothesis

Table 1 - Hypothesis 1

Model		B	β	*t*-value	*p*-value
1	(Constant)	-0.373		-0.577	0.565
	TEAMSIZE	0.077	0.042	0.585	0.559
	BIZCOACH	0.002	0.016	0.217	0.828
2	(Constant)	-0.044		-0.051	0.96
	TEAMSIZE	0.058	0.032	0.429	0.668
	BIZCOACH	0.002	0.013	0.18	0.857
	CONSCMIN	-0.005	-0.042	-0.571	0.569

[a]Dependent Variable: ZSCORE

Table 2 - Hypothesis 2

Model		B	β	*t*-value	*p*-value
1	(Constant)	-0.373		-0.577	0.565
	TEAMSIZE	0.077	0.042	0.585	0.559
	BIZCOACH	0.002	0.016	0.217	0.828
2	(Constant)	-0.377		-0.581	0.562
	TEAMSIZE	0.074	0.04	0.552	0.582
	BIZCOACH	0.002	0.015	0.207	0.836
	CONSCVAR	0.003	0.01	0.139	0.89

[a]Dependent Variable: ZSCORE

Table 3 - Hypothesis 3

Model		B	β	*t*-value	*p*-value
1	(Constant)	-0.373		-0.577	0.565
	TEAMSIZE	0.077	0.042	0.585	0.559
	BIZCOACH	0.002	0.016	0.217	0.828
2	(Constant)	-0.381		-0.583	0.561
	TEAMSIZE	0.076	0.041	0.576	0.565
	BIZCOACH	0.002	0.015	0.211	0.833
	EXTRAVAR	0.001	0.007	0.097	0.923

[a]Dependent Variable: ZSCORE

APPENDIX D – Hierarchical Regression Analysis Results by Hypothesis (Continued)

Table 4 - Hypothesis 4

Model		B	β	*t*-value	*p*-value
1	(Constant)	-0.373		-0.577	0.565
	TEAMSIZE	0.077	0.042	0.585	0.559
	BIZCOACH	0.002	0.016	0.217	0.828
2	(Constant)	-0.599		-0.702	0.483
	BIZCOACH	0.002	0.018	0.246	0.806
	TEAMSIZE	0.108	0.059	0.807	0.421
	EMOSTABMEAN	0.001	0.009	0.126	0.9

[a]Dependent Variable: ZSCORE

Table 5 - Hypothesis 5[a]

Model		B	β	*t*-value	*p*-value
1	(Constant)	-0.373		-0.577	0.565
	TEAMSIZE	0.077	0.042	0.585	0.559
	BIZCOACH	0.002	0.016	0.217	0.828
2	(Constant)	-0.733		-1.009	0.314
	BIZCOACH	0.001	0.012	0.166	0.869
	TEAMSIZE	0.1	0.054	0.751	0.454
	SQRTOPVAR	0.101	0.079	1.085	0.279

[a]Dependent Variable: ZSCORE

Table 6 - Hypothesis 6[a]

Model		B	β	*t*-value	*p*-value
1	(Constant)	-0.373		-0.577	0.565
	TEAMSIZE	0.077	0.042	0.585	0.559
	BIZCOACH	0.002	0.016	0.217	0.828
2	(Constant)	0.875		0.962	0.337
	TEAMSIZE	-0.004	-0.002	-0.026	0.979
	BIZCOACH	0	0.003	0.041	0.968
	AGREEMIN	-0.018	-0.144	-1.934	0.055

[a]Dependent Variable: ZSCORE

APPENDIX D – Hierarchical Regression Analysis Results by Hypothesis (Continued)

Table 7 - Hypothesis 7[a]

Model		B	β	*t*-value	*p*-value
1	AGREEMIN	-0.018	-0.139	-1.956	0.052
	CONSCMIN	-0.004	-0.03	-0.42	0.675
2	AGREEMIN	-0.018	-0.14	-1.967	0.051
	CONSCMIN	-0.002	-0.018	-0.249	0.803
	AGREEMIN X CONSCMIN	-0.001	-0.088	-1.239	0.217

[a]Dependent Variable: ZSCORE

Table 8 - Hypothesis 8[a]

Model		B	β	*t*-value	*p*-value
1	AGREEMIN	-0.019	-0.151	-2.058	0.041
	EXTRAMIN	0.003	0.026	0.357	0.722
2	AGREEMIN	-0.019	-0.152	-2.062	0.04
	EXTRAMIN	0.003	0.026	0.353	0.725
	AGREEMIN X EXTRAMIN	0.000	0.022	0.306	0.76

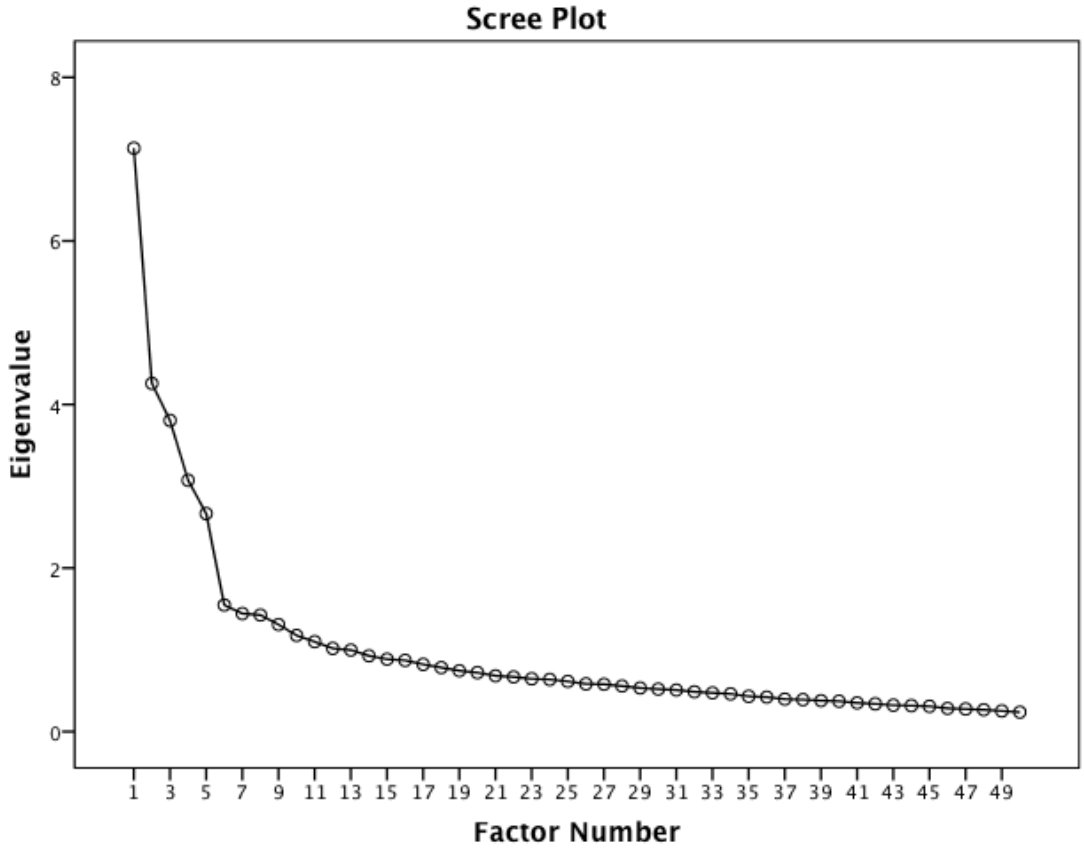
[a]Dependent Variable: ZSCORE

Table 9 - Hypothesis 9[a]

Model		B	β	*t*-value	*p*-value
1	CONSCMIN	-0.006	-0.045	-0.621	0.535
	EMOSTABMIN	-0.003	-0.024	-0.323	0.747
2	CONSCMIN	-0.007	-0.054	-0.729	0.467
	EMOSTABMIN	-0.002	-0.016	-0.211	0.833
	CONSCMIN X		0.053	0.725	0.469
	EMOSTABMIN	0.001	0.053	0.725	0.469

[a]Dependent Variable: ZSCORE

APPENDIX E – Scree Plot Analysis of Goldberg's 50 Item Personality Scale



VITA

Mark Collins is from Chattanooga, Tennessee. In 1977, he graduated from Windsor Boys School, a British Army School located in Hamm, West Germany where his father (Dr. R.J. Collins, an executive with E. I. du Pont de Nemours and Company) and family had been transferred in 1973. Collins graduated from University of Tennessee with a Bachelors of Arts degree in Economics in 1981 and received a Masters of Business Administration degree with co-concentrations in Marketing and Finance from Middle Tennessee State University in 1992. He worked for 18 years in hotel management and development (most as a business unit General Manager) with Memphis-based firms Holiday Inns Worldwide and Cooper Companies, and was subsequently appointed to the Board of Directors of The Tennessee Hotel and Motel Association. Collins has presented at the annual meetings of the Academy of Management and the Southern Management Association and has written several impactful articles in *Lodging* magazine, the leading monthly international publication in the hotel industry. The University of Tennessee conferred his Doctor of Philosophy degree in the spring of 2014. He is married to Sharon Cooper Collins of Canton, Ohio and they have five amazing children.