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Influence of Personality Type and Anonymity on Participation in a Group Support System

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THESIS

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Abstract

A group support system (GSS) uses a combination of networked personal computers, software that collects, manipulates, and aggregates member's individual input, and human facilitation to improve the group decision-making process. A GSS has been promoted as a means of improving the quantity and quality of ideas within a decision-making meeting. Research into GSS has focused on the benefits of providing anonymity to improve participation. Anonymity in a GSS supported meeting has been offered as a means to improve participation, which in turn improves decision quality. To date this has not been proven through research. In fact, there is conflicting evidence as to what the actual effects of anonymity are.

Research in social psychology provides a possible explanation for the conflicting results of the effects of anonymity. An individual's personality characteristics can effect how they participate in a decision-making meeting. The study examined how an individual's personality type and varying degrees of anonymity influence individual participation in a GSS meeting. The results of the study suggest personality characteristics have a significant impact on participation within a GSS supported meeting. Further, the results suggest personality and its interaction with anonymity has a positive effect on participation for some individuals, but not all. Consistent with most prior GSS studies, the results suggest anonymity does have a positive effect; however, this effect was significant only for certain personality traits.

INFLUENCE OF PERSONALITY TYPE AND ANONYMITY ON PARTICIPATION IN A GROUP SUPPORT SYSTEM

I. Introduction

The complex, constantly changing environment in which organizations must operate in has heightened the need for quality decisions. Meetings are an important part of the decision making process, but they are typically an ineffective means of producing a quality decision due to the complexities of the communication process (Mintzberg, 1983; Pollard and Hayne, 1996). Quality decisions may be dependent on the ability of an organization to conduct productive meetings. Group support systems (GSS) have been developed to aid in the decision making process by providing tools to increase the effectiveness and efficiency of the meeting.

Research into GSS has focused primarily on how the GSS can improve on the quantity and quality of ideas generated (Connolly, Jessup, and Valacich, 1990; George, Easton, Nunamaker, and Northcraft, 1990; Hiltz, Turoff, and Johnson, 1989). The use of anonymous inputs has been used to improve the quantity and quality of ideas generated. Anonymity allows group members to input comments without the risk of criticism before peers and superiors (Jessup, Connelly, and Galegher, 1990). Anonymous inputs can improve the decision making process by decreasing member domination, reducing conformance pressure, and decreasing the effects of status (Hayne and Rice, 1997).

Despite the theorized benefits of anonymous inputs, past research has not shown that *all* members benefit from anonymity. For example, the personality type of a group member along with varying degrees of anonymity may have an impact on the quantity

and quality of ideas generated (Jessup, Connolly, and Tansik, 1990; Matheson and Zanna: 1990). This study examines the effects of personality type and varying degrees on anonymity on the participation of individuals in the decision making process.

1.1 Background

A GSS is a computer-based technology that provides users with computer, communication, and decision support tools to increase the effectiveness and efficiency of decision-making groups (Turroff, Hiltz, Baghat, and Rana, 1993). "One of the key factors in group decision support systems is to facilitate the exchange of information, ideas, opinions, and options leading to decision making during group deliberations" (Er and Ng, 1995: 76). The GSS can reduce or eliminate barriers to communication, which should improve the group decision-making process (Lam, 1997; Jessup, Connelly, and Galegher, 1990).

The ability to make anonymous inputs is one advantage of a GSS. The group members can make inputs without identifying themselves and without the ability of identifying the authors of other inputs contributed in the discussion (Nunamaker, Dennis, Valacich, Vogel, and George, 1991). One feature of a GSS is the ability to have various degrees of anonymity. The various degrees of anonymity can range from the author's inputs being identified to those inputs being completely anonymous. For instance, the GSS software allows the users of the system to either label or not label each comment entered. If comments are labeled, the label could consist of the author's name, a pen name, or some arbitrary identifier, such as "USER 1" depending on the configuration of the system.

While generally accepted to be a positive attribute of a GSS, the specific effects of anonymity are unclear (Er and Ng, 1995; Jessup and George, 1997; Pinsonneault and Kraemer, 1990). Researchers have generally found participation is greater when anonymous participation is used (Connolly, Jessup, and Valacich, 1990; Jessup, Connolly, and Tansik, 1990; Jessup and Tansik, 1991). In an assessment of 200 GSS empirical studies Fjermestad and Hiltz (1999) reported that 53 studies looked at anonymity in a GSS meeting. The criteria for selection of studies was they had to be published in a refereed journal, the study groups had to consist of at least three members, and it had to be a controlled experiment. Of these 53, 13 used anonymity as an independent variable. The findings favor the use of anonymity to increase participation. Still, the idea that anonymity leads to more participation has not been demonstrated conclusively. For instance, some research has shown no difference in participation between groups using anonymous inputs and groups using identified inputs (George, Easton, Nunamaker, and Northcraft, 1990; Hiltz, Turoff, and Johnson, 1989; Lea and Spears, 1991).

These results raise the question of what is affecting the findings. One factor that may influence the effects of anonymity in a GSS session is personality type (Kiesler, Siegle, and McGuire, 1984). Volumes of research in the field of psychology have shown an individual's personality type can dictate how they react in group dynamics, such as in the group decision-making process (Diener, 1979; Kiesler, et al., 1984; Zimbardo, 1970). Of specific concern are the effects of disinhibition, which is the temporary loss of inhibition caused by an outside stimulus (Diener, 1979), and deindividuation, which is a situation where individuals feel they cannot be singled out in a group (Zimbardo, 1970).

Some individuals want and need the social interaction afforded them in a face-to-face meeting, while others tend to withdraw and not contribute in such an environment (Dipboye, 1977). GSS research has focused only on the benefits or drawbacks of anonymity and not on how individuals could benefit from varying degrees of anonymity in a GSS meeting.

There are numerous methods to determine an individual's personality type, but the most widely used by researchers is the five-factor model of personality (Schmit, Kihm, and Robie, (2000). The five factors are Extroversion, Agreeableness, Conscientiousness, Neuroticism, and Openness. Table 1 provides a definition and list of facets for each of the five factors. The model makes it possible to break these factors down further into sub-categories, or facets, to get a more detailed view of an individual's personality type. The sub-categories make it possible to study specific attributes of ones personality such as how one orders their thoughts, their level of trust, or how modest they are.

Table 1: Factors and facets of the five-factor model

Neuroticism: The predisposition to experience negative affects such as anxiety, anger, and depression and other cognitive and behavioral manifestations of emotional stability. **Facets:** Anxiety, Anger, Depression, Self-Consciousness, Impulsiveness, and Vulnerability
Extraversion: Includes sociability, activity, dominance, and the tendency to experience emotions. **Facets:** Warmth, Gregariousness, Assertiveness, Activity, Excitement-Seeking, and Possitive Emotions
Openness: Seen as immaginativeness, aesthetic sensitivity, depth of feeling, curiousity, and the need for variety. **Facets:** Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values
Agreeableness: A dimension of interpersonal tendencies that encompasses sympathy, trust, cooperation, and altruism. **Facets:** Trust, Straightforwardness, Altruism, Compliance, Modesty, and Tender-Mindedness
Conscientiousness: Comprises the feeling of being well-prepared for life and the tendency to adhere to ethical principles and moral obligations and includes organiztion, persistence, scrupulousness, and the need for achievement. **Facets:** Competency, Order, Dutifulness, Achievement Striving, Self-Discipline, and Deliberation

1.2 Problem Statement and Purpose of Research

The specific concern of this study is how an individual's personality type and varying degrees of anonymity influence individual participation in a GSS meeting. There has been minimal research into the effects of personality type on group member's participation in a GSS meeting. Of the 200 GSS empirical studies reviewed by Fjermestad and Starr (1998), only five have looked at member characteristics, none of which included personality traits. If the degree of anonymity could be aligned so that it is

consistent with the participants' personality types, it may be possible to improve the results of the meeting. For example, if it is shown that an individual with a specific personality characteristic participates more in a lower degree of anonymity and most of the meeting participants have this characteristic, it may be beneficial to set up the meeting with a lower degree of anonymity.

This study will examine the effects of anonymity and personality type using three degrees of anonymity. The three degrees are unidentified inputs and unidentified author in a GSS meeting, identified inputs and unidentified author in a GSS meeting, and identified inputs and identified author in a GSS meeting. This study will address the issue of whether personality type combined with varying degrees of anonymity affect the amount of participation. The results will provide information necessary to evaluate the need for tailoring of a GSS session to align with group member personality types.

1.3 Research Applicability to the United States Air Force

Continual budget and manpower cuts make it vital to the success of the Air Force to "do more with less". Gone are the days of sending personnel to expensive, time-consuming, and unproductive meetings. There is now an emphasis to cut costs and to make better, timelier decisions. The result is a need for more efficient and effective meetings.

Streamlined acquisition has brought about a new way of doing business for the Air Force. In today's environment it is important for everyone involved to work together, which includes government personnel, contractors, and any others that work to meet the needs of the Air Force. But this can be difficult since government personnel and

contractors have competing agendas. The Air Force wants the most cost effective product and the contractors must make a profit to survive. This makes it difficult to have effective meetings since the best solution may not be discussed for fear of making contractual obligations or from retaliation from the individual's peers and superiors. A GSS meeting can provide the anonymity needed to allow individuals to discuss ideas freely without fear of retribution.

The Acquisition Support Team (AST) at Warner-Robbins Air Logistic Center is an example of a GSS facility in use in the Air Force. The AST conducts risk assessment workshops with the GSS to evaluate acquisition risks. It allows government personnel and contractors to work together to determine requirements, develop specification documents, and solve critical problems. This has been so successful that a second GSS facility was established.

In response to budget cuts, the Air Force initiated the use of modern business practices in a concept called Lean Logistics. To implement all the needed changes there was a need to increase communication and collaboration throughout the Air Force. To support this effort the Air Force Research Laboratory developed a distributed computer-mediated decision support system. The system was composed of two components. The second component was the Depot Operations Modeling Environment (DOME). This component utilizes distributed GSS technology. The goal of the DOME system is to aid in the design and modeling of Air Force logistics processes. It allows collaboration among workers at any time and from any place. It has been successfully demonstrated at the Warner-Robbins ALC, Robins AFB, Georgia and the 366th Wing at Mountain Home AFB, Idaho.

Clearly, the use of GSS technology is becoming more prevalent in the Air Force to meet the needs of a smaller force structure and budget. The goal of the GSS is to improve the quality of the decision-making process and to reduce expenses associated with this process. With this goal in mind, it is important to optimize the use of a GSS, and the results of this study can help make a decision-making meeting more productive.

1.4 Summary

A GSS is a relatively new technology that still requires a great deal of research to understand its true potential. GSS research can benefit from the research done in the field of psychology. Psychology research has shown that personality traits can affect how an individual interacts in a group setting. GSS researchers can draw from this knowledge and apply it to their research, but to date this has not been done. This study will use this knowledge and apply its concepts to a GSS setting.

1.5 Sequence of Presentation

Chapter II of this thesis provides a review of the relevant literature from the body of GSS research with emphasis on literature, which pertains to the dependant variables studied in this thesis. Chapter III focuses on the methodology used to conduct the research for this study. The data collected and the results of this study are presented in Chapter IV. Finally, Chapter V will interpret the data with respect to the hypotheses that were investigated with this study. The findings will be presented with the conclusions, limitations, and recommendations for future research in the area of collaborative communications.

II. Literature Review

2.1 Introduction

The complexity of the business world makes it impossible for a single individual to make all the corporate decisions (Er and Ng, 1995). An individual cannot make these decisions because they do not have all the knowledge or expertise needed. This has led to the need for groups of managers and experts to make the business decisions. One means of dealing with this complexity and facilitating the business decisions is through meetings. Meetings allow all the players to come together, exchange information, and reach a decision.

Despite the potential effectiveness of meetings, there are still problems. "Time is money" is a much-used phrase in the business world. Therefore, it is important for businesses to make the best use of the time available. Time is a critical issue for front-line workers, and even more so for managers. Managers spend a great deal of time in decision-related meetings, which is a result of the changing business environment. This has prompted the need for more efficient and productive meetings to better utilize time. Information technology has come to the forefront as a means to aid in improving time management.

Managers tend to resist meetings due to the amount of time spent in them and their inefficiencies (Er and Ng, 1995; Nunamaker, Briggs, Mittleman, Vogel, and Balthazard, 1997). Due to this resistance, methods have developed to improve the meetings effectiveness (Huber, 1984). The first attempts were to improve the face-to-face meetings through such methods as the Nominal Group Technique and the Delphi Technique (Huber, 1984). The next step was to automate the face-to-face meetings

through the use of computer mediated communication and group decision support systems.

The advent of computer supported meetings brought about other problems with meetings. The primary goal of a decision-making meeting is to produce a high quality decision. For the computer supported meeting, or any type of meeting, to be productive it must have participation from all its members. Individuals interact differently in group settings, so it is important to understand how group dynamics will affect the decision-making process. Developers of computer-supported meeting systems try to incorporate methods to not only support the meeting, but also to improve member participation.

This chapter explores how GSS's were developed to assist in the decision-making process. Emphasis will be placed on anonymity, the use of anonymous inputs from group members, in a GSS meeting. It will also explore personality traits to determine if they have an impact in the group decision-making meeting. Finally, this chapter details the theoretical basis and the hypothesis investigated for the research contained in this study.

2.2 History of GSS

The roots of GSS can be found in the combination of computer mediated communications systems (CMCS) and group decision support systems (GDSS). By combining the two it was possible to develop the distributed group support systems that are in use today.

CMCS supports the communication process with computer technologies. Early CMCS's used a computer to organize, store, process, and distribute individual communications that are primarily text-based (Hiltz and Turoff, 1985). E-mail is the

most common example of a CMCS, but they also include computer conferences, computer bulletin boards, and routine transfers of data. Technical users were the original users of a CMCS, but once they were found to be useful they were made available to others (Kiesler, Siegal, and McGuire, 1984). The CMCS's were a key component in the development of computer networks, which made it possible to link more and more users.

Along with the development of CMCS, GDSS's were developed to bring people together in what has been referred to as "decision rooms". A GDSS is a combination of software, hardware, and procedures that aid groups in the decision-making process (Huber, 1984). Their main purpose was to improve the effectiveness of the group in a same-time/same-place setting (Nunamaker, et al., 1997). They typically consisted of a large screen for viewing common information and one or more terminals for use by the meeting participants. The original systems were designed to support small groups meeting within the same room (Turoff et al., 1993).

The early GDSS did not provide a significantly greater capability than a typical face-to-face meeting did. Their main purpose was to automate the existing meeting process. The automation of this process did result in a shift of the meeting members thought processes. That is, meeting participants no longer had to express views or explain all the information verbally because some of it could be created and displayed during the meeting (Huber, 1984). As the GDSS progressed, it incorporated decision support tools and processes to aid in solving problems and developing solutions.

Once CMCS established the link between people and corporate information, the GDSS could take advantage of networks to gain access to a multitude of data, tools, people, and other computer media. Group members could now work together using the

tools and resources at the same time. It was now possible to use interactive tools that supported brainstorming, voting, Nominal Group Technique, and many others. Today, these systems are referred to as GSS.

2.3 GSS Research

Research into GSS has focused primarily on how they can make the decision-making meeting more efficient and effective than a typical face-to-face meeting (Fjermestad and Hiltz, 1999; Nunamaker, et al. 1997). In a meta-analysis of GSS research, Anson, Bostrom, and Wynne (1995) found that GSS supported meetings made higher quality decisions when compared to face-to-face meetings.

Presumably, the GSS improves the decision quality by improving the communication and coordination process of the decision-making meeting. According to Turoff, et al. (1993), a GSS can provide at least five types of communication support to make the meeting more efficient and effective: alternative communication channels for the group, process structuring for communication protocols and human roles, support for data handling, availability of decision aids, and synchronization of the communication process.

A GSS also makes it possible for each participant to act as an individual problem solver (Turoff, et al., 1993). Each participant is supplied with all the tools necessary to accomplish the task. Due to the complexity of today's problems no one individual has all the needed experience, resources, or information to solve such problems individually (Nunamaker, et al., 1997). Therefore, groups must be formed to pool all the needed attributes to reach a high-quality decision. The GSS brings the group members together,

but still makes it possible for each member to function individually. The GSS synchronizes the individual processes into one group process.

Most GSS's provide parallel processing of inputs, which makes it possible for more than one group member to provide inputs simultaneously. In a face-to-face meeting there are numerous inhibitors of verbal idea generation. Some of the more significant inhibitors are production blocking, social loafing, and evaluation apprehension (Valacich, Dennis, and Nunamaker, 1992). Production blocking refers to the fact that only one person can communicate at a time (Diehl and Stroebe, 1987). The ability of a GSS to have parallel processing means more inputs can be made in the same amount of time (Connolly, et al., 1990). This effectively eliminates the problem of production blocking found in face-to-face meetings. In a brainstorming session, the amount of ideas generated is of paramount importance, so the ability to make inputs at the same time as other group members will improve the brainstorming session.

Parallel processing should lead to more inputs, but this has not been proven conclusively in prior research (Connolly, et al., 1990; Er and Ng, 1995; George, et al., 1990; Hiltz, et al., 1989; Jessup, et al., 1990; Jessup and George, 1997; Jessup and Tansik, 1991; Pinsonneault and Kraemer, 1990). The ability to make more inputs does not necessarily mean more inputs will be made. There are many reasons for the inconsistencies in levels of participation. Proximity of group members, group size, anonymity of inputs, or other factors may affect an individual's participation level (Jessup, et al., 1990).

The different "types" of anonymity used during a GSS meeting may explain the varying participation levels that have been found in GSS research. Valacich, Jessup,

Dennis, and Nunamaker (1992) concluded there are two types of anonymity: process and content. Process anonymity is the extent that group members cannot attribute participation to individual group members through direct observation. Content anonymity is the extent that group members cannot attribute specific contributions to participants. Typically comments in GSS include embedded identifiers (labels for a participant, e.g., blue, green, etc.). Removing the comment labels provides both process and content anonymity.

Content anonymity can be detrimental to the performance or participation of individuals (Valacich et al., 1992). Content anonymity provides a purely anonymous setting, which may actually impede the communication process. Communication involves a message, a sender, and a receiver. In an anonymous setting the sender and the receiver are not known. Individuals find it difficult to integrate comments into a conversation since they do not know who provided the comment. They also find it difficult to defend or criticize ideas since they do not know who to converse with. The difficulty individuals have with the communication process in this setting will increase the amount of time needed to complete a task (Dennis and Kinney, 1998).

2.4 Role of Anonymity in GSS Meetings

The literature on anonymity in a GSS meeting has shown mixed results. The use of anonymity can have both positive and negative effects on member participation. The productivity gains or losses due to anonymity can be a result of numerous aspects of interpersonal processes. It has been commonly held that anonymous inputs decrease evaluation apprehension, decrease status competition, and breaks down social barriers

and conformance pressures, which may lead to greater participation (Connolly et al., 1990; George et al., 1990; Hiltz et al., 1989; Jessup et al., 1990; Kiesler et al., 1984; Jessup and Tansik, 1991). It is also held that anonymity induces social loafing and flaming and reduces accountability, which may decrease participation (Er and Ng, 1995; Jessup and George, 1997; Pinsonneault and Kraemer, 1990).

Some of the effects of anonymity on individual participation can be seen in social psychology research. Festinger, Pepitone, and Newcomb (1952) developed the idea of deindividuation, which occurs when individual members seem to lose their individuality when interacting within a group. Individuals feel they are submerged in the group and cannot be identified by other group members. This submergence allows the individuals to engage in activities they normally would not.

Deindividuation has been separated into positive and negative behaviors by some researchers (Hiltz et al., 1989; Zimbardo, 1970). Hiltz et al. (1989) defined the positive behaviors as deindividuation and negative behaviors as disinhibition. Their definition of deindividuation is as "a decreased reliance by individual group members on their own opinions and values, and increased conformity to group opinions and norms (Hiltz et al., 1989: 221)". They defined disinhibition as "deviant or anti-social behavior, which they would usually inhibit (Hiltz et al., 1989: 220)". Whether the positive or negative behaviors are separated or not is not of prime concern, but their outcomes are. Thus, this study considers both the positive and negative behaviors as "deindividuation", which allows individuals to display behaviors they would normally inhibit, such as aggression or deception.

2.4.1 Positive Effects of Deindividuation

Festinger et al. (1952) stated deindividuation allows individuals to behave in a way they normally would not. This does not necessarily mean the behavior is abnormal. The individual may go along with an intelligent decision the group has made even though they do not agree with the decision. In this context, going along with the group would be a positive, productive action.

Deindividuation, as noted by Festinger et al. (1952), lessens inner restraints and allows group members to fulfill needs they could not meet when their actions are identifiable by other group members. The anonymity offered in a GSS eliminates evaluation apprehension or the fear of criticism or reprisal. This results in a positive effect that may lead to increased participation. For example, an individual may not want to make a comment that is questionable or will not be accepted without criticism. They would be reluctant to make this comment if they were identified as the author. If they know others will not know they made the comment they would more likely make the comment.

Anonymity can have a positive effect on the status of group members. Groups that have an unequal status may inhibit low-status members from participating. They may feel threatened by the higher status members. Anonymity can be used to overcome the fear of status. Wilson and Jessup (1995) attempted to determine the effects of anonymity on status, but their results were inconclusive. They determined status is a difficult construct to measure the effects of. It may have minor effects on participation levels, but the results are buried within other constructs. This was a field experiment so it suffered from a small sample size. They did state "there is compelling evidence in the

literature to suggest that an organizationally-based status variable is important (Wilson and Jessup, 1995: 220)".

2.4.2 Negative Effects of Deindividuation

In a negative sense, deindividuation may lead individuals to engage in any number of deviant or counterproductive activities. An individual may take advantage of the anonymity and express their opinions much stronger than if they were known, which is known as flaming. Since their comments are anonymous they tend to be overly critical of others comments. Jessup and George (1997) and Valacich et al. (1992) found anonymity led some group members to be overly critical of others comments. They may take this even further by using strong language, name calling, or aggressive messages.

Social loafing is another negative aspect of deindividuation. Social loafing is the tendency for individuals to put forth less effort when working in a group than they would if they were working individually (Valacich et al., 1992). The individual does not feel the need to exert as much energy since they know the efforts of the group are pooled. Also, since only one person can talk at a time there is competition for making comments. The individual may believe their comments are not needed to reach a decision, so they choose to not exert the energy needed to have their comments heard. This type of action leads to a reduction in participation.

Social psychology experiments conducted by both Zimbardo (1970) and Diener, Fraser, Beaman and Kelem (1976) found that anonymity enabled individuals to behave in a way they normally would not had they been identified. Zimbardo found that anonymous individuals delivered longer electrical shocks to other experiment participants

than the identified individuals did. In an experiment with trick-or-treaters, Diener found an anonymous group was twice as likely to steal candy than the non-anonymous group. Both experiments were designed to make the subjects feel their actions were anonymous. They both resulted in the subject's displaying deviant or negative actions.

2.4.3 Anonymity and an Individual's Inner State

As stated earlier, anonymity lessens inner restraints and allows individuals to behave in a way they normally would not. But to determine what is abnormal behavior one must first know what is normal behavior. Diener (1979) stated internal standards, such as values or morals, might determine the effect anonymity has on deindividuated behaviors. This led him to conclude deindividuating behaviors may or may not be displayed depending on an individual's internal standards. Pinsonneault and Heppel (1997) supported this claim through their analysis of psychological research. They observed "anonymity has been found to interact with other situational factors, making its relation to deindividuation quite unpredictable and complex (Pinsonneault and Heppel, 1997: 96)". They further explained it has been difficult to assess the effects of anonymity since most empirical research has treated anonymity as a single cause of deindividuation.

Jessup and George (1997) also questioned the inconsistent findings within anonymity research. They concluded the inconsistencies are not due solely to the technology, but because of subject-related factors. The inner state of the individual is what compels that individual to act in a certain way. The inner state of the subjects has as much an effect on their participation as the anonymity. They therefore concluded the

anonymity acts as a mediator between the individual's internal processes and the actions they take. Figure 1 depicts the role Jessup and George (1997) believes anonymity plays.

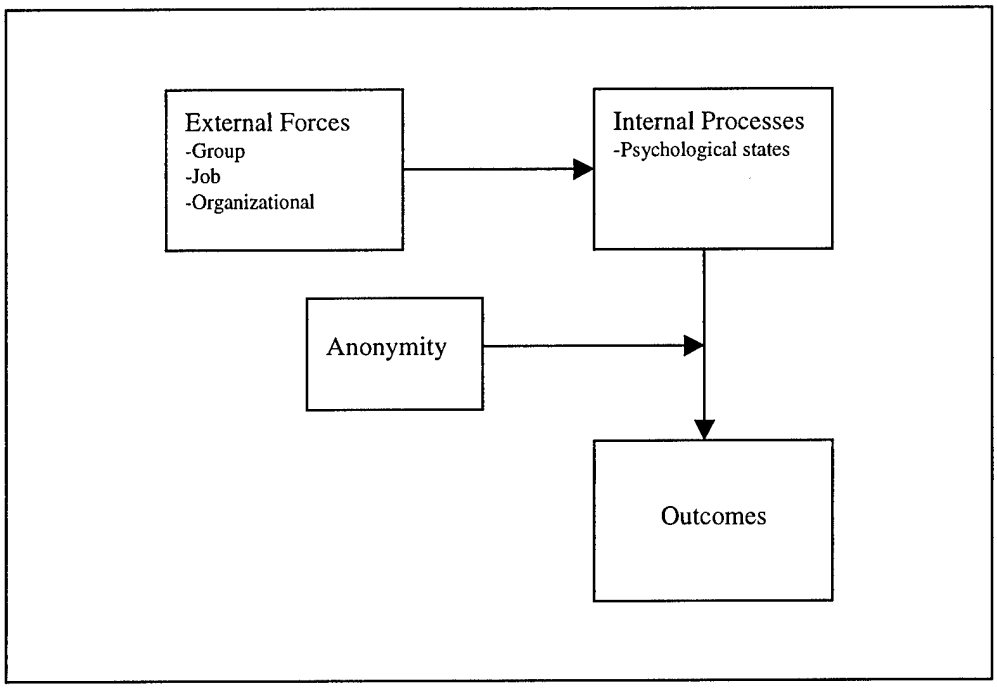


Figure 1: The Role of Anonymity in Motivation and Outcomes

The inner state of an individual would be difficult, if not impossible, for one to change. "In our understandings and research about personality, we have come to recognize that to behave in ways not consistent with one's inborn pattern takes a tremendous amount of energy (Berens, 1996: 1)." It is not impossible to alter these inner states, but it is easier to change the environment to elicit a different state. A moderator could be introduced to change the environment, thus eliciting a different state and a different outcome.

2.5 Social Psychology Research

The role personality plays in a GSS has not been systematically researched. However, research in social psychology supports the idea that anonymity alone does not result in disinhibited behaviors (Diener et al., 1976; Maslach, 1974; Nadler, Goldberg, and Jaffe, 1982; Zimbardo, 1969). Research on the effects of personality on group performance show that disinhibited behaviors alone is not enough to predict participation or performance in a GSS meeting. Also, there are other factors, such as self-differentiation, that when combined with anonymity may or may not result in disinhibited behaviors.

2.5.1 Effects of Personality on Group Performance

Studies in social psychology have been done to examine the effects of personality on group performance. These studies attempted to determine if personality could be used to predict individual and team performance. Personality has been shown to be a good predictor of job performance (Arneson, Millikin-Davies, and Hogan, 1993; Barry and Stewart, 1997; Day and Silverman, 1989; Gellatly, Paunonen, Meyer, Jackson, and Goffin, 1991; McHenry, Hough, Toquam, Hanson, and Ashworth, 1990; Neuman, Wagner, and Christiansen, 1999; Neuman and Wright, 1999; Rosse, Miller, and Barnes, 1991). Barrick and Mount (1991) and Tett, Jackson, and Rothstein (1991) both conducted meta-analyses on personality research and concluded there is a relationship between an individual's personality and their job performance. These studies are useful for this study to validate that personality does in fact have an impact on individual participation and group performance.

Neuman and Wright (1999) examined the effects of personality traits at both the individual level and the group level and concluded personality is a predictor of performance at both levels. Their study observed three predictors of job performance: job-specific skills, general cognitive ability, and personality traits. The first two predictors, job-specific skills and general cognitive ability, have been shown to be reliable predictors of job performance. However, Neuman and Wright focused on whether personality contributed to performance beyond these two predictors. They used the five-factor model to determine the individual's personality on two of the factors: Agreeableness and Conscientiousness. They evaluated the results at the individual level and the group level. The group level was determined by using the least capable member's scores across all three predictors. This method is based on Steiner (1972), which implies in certain types of tasks if one member fails the whole team fails. They concluded "the personality traits of Agreeableness and Conscientiousness proved to be predictive of work team performance (Neuman and Wright, 1999: 385)" at both the individual and group level. This finding links directly to this study since it is also examining these two factors.

Studies have also been done to show how the personality composition of work teams can affect team effectiveness (Driskell, Hogan, and Salas 1988; Hackman and Morris, 1975; Mann, 1959; Neuman et al. 1999). These studies have found there is a link between personality and the performance of the group. Neuman et al. (1999) looked at two aspects of personality composition for work teams: team personality elevation (TPE) and team personality diversity (TPD). TPE is the team's average level of a given trait and TPD is the variability of a given trait within the team. They used the five-factor

model to measure each team member's personality traits. They found TPE predicted team performance for the traits of agreeableness, conscientiousness, and openness. TPD predicted team performance for extraversion and neuroticism. Typically only individual differences were considered when selecting individuals for work teams. They concluded the "similarity of individual trait differences should also be considered when making team selection decisions (Neuman et al., 1999: 42)". This implies meeting effectiveness can be optimized if the personality make-up of the group is considered.

2.5.2 Effects of Personality and Anonymity on Deindividuation

Social psychology research into deindividuation began with Zimbardo's theory of deindividuation. Research followed the theory by linking certain conditions, such as anonymity, with their behavioral consequences. At first, research followed the line that given these conditions everybody would display deindividuated behaviors. This thought was changed by Dipboye (1977) when he concluded some individuals would benefit from deindividuation while others would not. This resulted in a shift in thought to the position that the condition and the inner state of the person determines the behavioral outcomes.

Nadler et al. (1982) concluded the combination of the personality characteristics of self-differentiation and anonymity could result in different deindividuation outcomes. Self-differentiation is a sense of individualism one has in a social environment. An undifferentiated individual does not feel this sense of individualism. The self-differentiated individual relies on their inner self while undifferentiated individuals rely on the external environment to guide their behavior. Their findings supported their claim that an undifferentiated individual would display deindividuating behaviors while a self-

differentiated person would display little or no effect on deindividuating behaviors. The self-differentiated individuals relied on internal cues to guide their behavior. The undifferentiated person relied on internal cues when they were identified, but did not rely on them when they were not identified.

The results of Nadler et al. (1982) show personality characteristics and anonymity can have an impact on deindividuating behaviors. This means an individual may or may not display deindividuating behaviors depending on their personality characteristics and the anonymity afforded them. To determine an individual's actions, both anonymity and personality characteristics must be considered. The results of Nadler et al. should be combined with research on the effects of personality characteristics on group performance to gain a better picture of the effects of anonymity in a GSS meeting. Figure 2 simplifies the model developed by Jessup and George (1997) and depicts a high-level representation of anonymity as a moderator of an individual's personality in determining their participation in a GSS meeting.

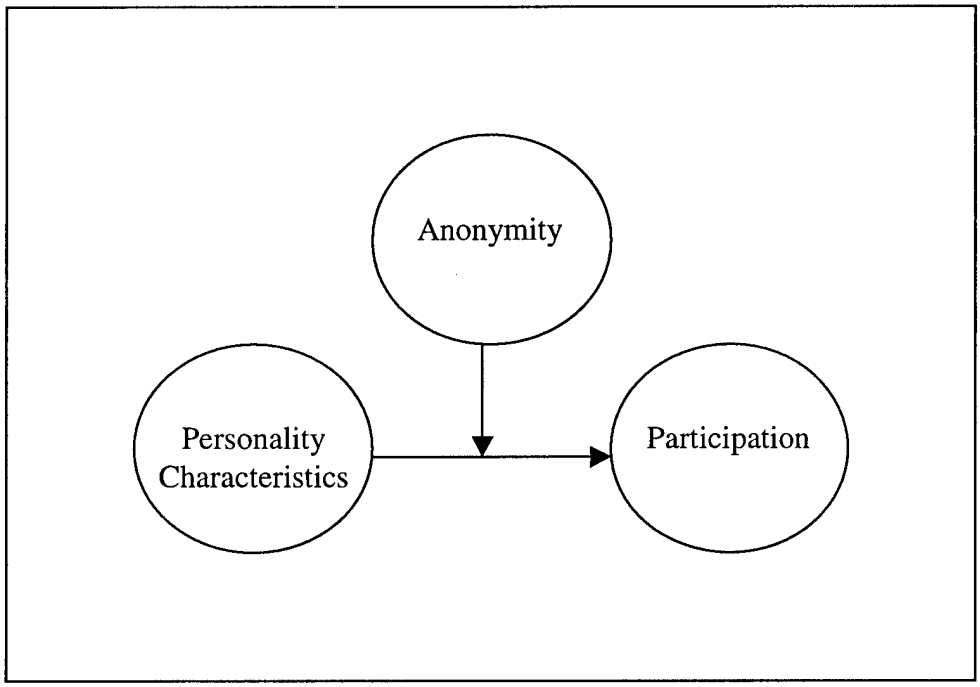


Figure 2: Personality Model

2.6 Development of the Five-factor Model of Personality

In the 1980's personality research focused primarily on methodologies for measuring individual differences. The methodologies were based on well-known theories such as those of Carl Jung. The major drawback to this approach was that they did not focus on a core set of meaningful traits (McCrae and Costa, 1987). Researchers recognized this problem and their focus shifted to developing a comprehensive taxonomy of personality traits for all researchers to follow.

The development of a trait taxonomy was not a new concept. Trait theorists believed a list of descriptive adjectives could be used as a list of personality traits. Allport and Odbert (1936) started the study of traits by conducting a study to determine possible trait names for use in personality research. Others attempted to analyze the

English language and identify important individual differences. From the identified differences a list of trait names could then be derived.

Over the years researchers attempted to limit the number of traits by factor analyzing ratings on all of the traits. Researchers could then determine what traits should be in the taxonomy and could then propose their list. There have been numerous versions with the more popular ranging from three trait factors up to 24. Tupes and Christal (1961) developed the first five-factor model. Norman (1963) replicated the Tupes and Christal model, but developed a more abbreviated set of variables, or facets, to define the five factors. Norman's model consisted of four facets for each of the five factors. McCrae and Costa (1987: 81) stated Norman heralded this new taxonomy as "an adequate taxonomy of personality". His taxonomy was somewhat ignored until a push in the 1980's to develop a comprehensive taxonomy.

From the efforts of previous researchers five traits were derived that represented the structure of personality. The five traits identified are Neuroticism, Extroversion, Openness, Agreeableness, and Conscientiousness. These five traits emerged as the most promising to represent individual personality and became known as the five-factor model of personality.

The five-factor model is not tied to any single theory on personality. McCrae and Costa have shown the five-factor model fits with most of the existing personality inventories, such as the Meyers-Briggs Type Indicator (MBTI) (Goldberg, 1992; McCrae and Costa, 1989). As shown in McCrae and Costa (1989) the four MBTI indices that make up the 16 types measure four of the five factors in the five-factor model. These

results were encouraging to researchers since one indicator of a valid taxonomy is that it should be applicable across theories.

The model has been shown to be valid across instruments and observations (McCrae and Costa, 1987). The researcher can use questionnaire scales or adjective factors and have the measurements conducted by self-reports or by peer ratings. This means regardless of the means of measurement the results are consistent. "One of the strongest arguments in favor of the five-factor model has been its appearance in both self-reports and ratings (McCrae and Costa (1987: 82)".

Another benefit of the model is its popularity among researchers. There is a large base of research that has used the model. Because of this, the measures that have been developed are mature and well accepted by other researchers. For example, this model has been used by numerous researchers to show a link between personality and job performance (see Arneson, Millikin-Davies, and Hogan, 1993; Barrick and Mount, 1991; Barry and Stewart, 1997; Day and Silverman, 1989; Digman, 1990; Gellatly, Paunonen, Meyer, Jackson, and Goffin, 1991; McCrae and Costa, 1989; McHenry, Hough, Toquam, Hanson, and Ashworth, 1990; Neuman, Wagner, and Christiansen, 1999; Neuman and Wright, 1999; Rosse, Miller, and Barnes, 1991; Tett et al., 1991).

The five factors each represent a broad domain of personality with each being defined by a group of inter-correlated traits, which are known as facets. Paunonen (1998) found that even though there may be some disagreement about the usefulness of the five factors there is agreement a level below these factors would be very useful. The domain score is determined by summing the facet scales, which can be done by using any number of the facets. A facet can be primarily and secondarily related to a higher-level domain.

This means a facet that is primarily related to one domain may also be secondarily related to another domain.

Costa and McCrae (1992) found that by analyzing individual differences at the facet level could have more meaning than at the broader domain level. As stated, a domain score is determined by summing the facet scores for that domain. This can be done because there is a probability that an individual will score relatively the same (high, low, etc.) on all facets within a domain. This does not mean they will always score the same. By analyzing results at the facet level the researcher can determine differences within a domain as well as at the domain level. It is possible two individuals will have the same domain score, but one scores high on one facet while the other scores low on the same facet. If the facet scores were not known this difference would not be seen. This is why Paunonen (1998) stated it is more useful to look at a lower level.

The first step to understanding the usefulness of the five-factor model for this study is to examine the domains and the facets. Due to constraints, such as the time required to administer the questionnaire, not all of the domains and facets could be studied. To narrow the selection, only domains and facets that were deemed relevant to group decision-making were selected for this study. Particularly the domains of Agreeableness and Conscientiousness were chosen since they have shown promising results in past social psychology research. Since this study is concerned only with these two domains, the remaining three will not be discussed. These domains are determined by summing the facets below them. In this case Trust, Straightforwardness, and Compliance will be used to measure Agreeableness. Competence, Order, and Deliberation will be used to measure Conscientiousness.

The six facets used to determine Agreeableness and Conscientiousness will also be used to predict participation. As stated previously, personality can be evaluated at both the factor and the facet level. By evaluating at the facet level it is possible to get a more detailed understanding of what is effecting participation. The next few paragraphs will describe each of the applicable domains and facets.

2.6.1 Personality Domains

Figure 3 below depicts the hypothesized model for the moderation of anonymity between the personality domains of agreeableness and conscientiousness and an individual's level of participation. The model also shows the facets of trust, straightforwardness, and compliance are used to determine an individuals level of agreeableness and the facets of competence, order, and deliberation are used to determine and individuals level of conscientiousness.

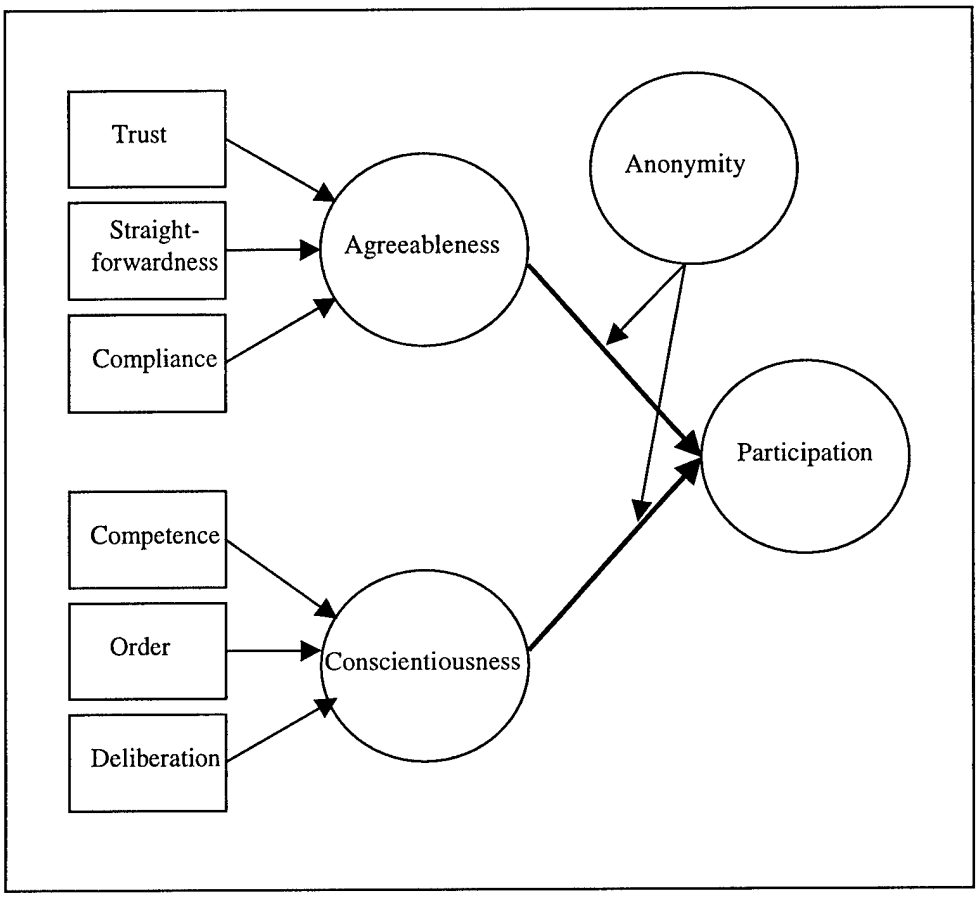


Figure 3: Personality Domain Model

2.6.1.1 Personality Domain: Agreeableness

Agreeableness "is primarily a dimension of interpersonal tendencies (Costa and McCrae, 1992: 15)". The agreeable person is more willing to help others and they expect others to help them in return. They are also more willing to resolve conflicts. However, these positive aspects may result in dysfunctional behavior. These individuals may be more dependent on others. They have a strong desire for social approval, which may not be appropriate in a situation where they should be assertive. In this instance they would avoid social conflict and defer to others. The disagreeable or antagonistic person is more

competitive and less willing to help others. They are also skeptical of others intentions when they are helpful. This may lead them to be confrontational.

Previous research has shown Agreeableness can be a good predictor of job performance (Barrick and Mount, 1991; Rose, Fogg, Helmreich, and McFadden, 1994; Neuman et al., 1999; Tett et al., 1991). Aronoff and Wilson (1985) identified, among others, the Agreeableness facets of Trust, Straightforwardness, and Compliance as being desirable for social interaction. Agreeable individuals are more willing to work with others and resolve conflicts. They will listen to others arguments or complaints and attempt to come to resolution. In contrast the disagreeable person will be attempting to have their opinions heard. A disagreeable, or antagonistic, person feels they are always fighting against others (McCrae and Costa, 1987). The antagonistic person wants to dominate and have their opinions heard over the opinions of others.

The anonymity offered in a GSS can allow an agreeable person to inhibit their normal agreeable nature. They can be disagreeable without fear of others knowing who they are. They can also attempt to dominate the meeting instead of letting others control the meeting.

> *Hypothesis* 1a: An individual with a low level of agreeableness will provide more on-task comments than an individual with a high level of agreeableness.
>
> *Hypothesis* 1b: An individual with a high level of agreeableness will provide more affirmation comments than an individual with a low level of agreeableness.
>
> *Hypothesis* 1c: Anonymity moderates the relationship between agreeableness and participation such that an individual with a low level of agreeableness will provide more on-task comments with a high level of anonymity than with a low level of anonymity.

2.6.1.2 Personality Domain: Conscientiousness

Conscientiousness is characterized as the "active process of planning, organizing, and carrying out tasks (Costa and McCrae, 1992)". The conscientious person strives for excellence, sets high standards, and is considered hard working and achievement oriented. They tend to be more task-oriented and strive to accomplish given tasks. The unconscientiously person tends to be more lackadaisical in their efforts to accomplish given tasks.

As with Agreeableness, Conscientiousness has been shown to be a good predictor of job performance (Barrick and Mount, 1991, Barrick, Mount and Strauss, 1993; Neuman and Wright; Zander and Forward, 1968). Zander and Forward (1968) also found that some facets of conscientiousness are predictors of work team performance. They concluded conscientious individuals will strive to complete given tasks on schedule and in a timely manner regardless of any expectations placed on them.

As stated previously, social loafing and free riding can be a problem with group work. Conscientious individuals are self-motivated and task-oriented, so they will contribute their thoughts and ideas to complete the given task. These individuals will stay committed to the task and ensure the goals of the group are met. The unconscientiously individual does not have this motivation. They will not be as compelled to participate without some external stimulus to motivate them.

Bernardin, Cooke, and Villanova (2000) studied the effects of conscientiousness on rater leniency. They stated accountability is an important aspect when determining the affect conscientiousness will have. In an anonymous setting there is no identifiable

accountability to the individual. They know if they choose not to participate no one will know due to inputs being made anonymously. In an identified setting others will know they are not contributing.

> *Hypothesis* 2a: An individual with a high level of conscientiousness will provide more on-task comments than an individual with a low level of conscientiousness.
>
> *Hypothesis* 2b: An individual with a high level of conscientiousness will provide more affirmation comments than an individual with a low level of conscientiousness.
>
> *Hypothesis* 2c: Anonymity moderates the relationship between conscientiousness and participation such that an individual with a low level of conscientiousness will provide more on-task comments with a low level of anonymity than with a high level of anonymity.

2.6.2 Personality Facets

Figure 4 below depicts the hypothesized model for the moderation of anonymity between the personality facets of trust, straightforwardness, compliance, and competence and an individual's level of participation once the domain-level constructs are removed. The model also shows anonymity does not have a moderating effect between order and deliberation and an individual's level of participation. This model was developed to get a more detailed facet-level view of the effects of personality characteristics and anonymity consistent with suggestions by Costa and McCrae (1992) on the potential efficacy of such an approach.

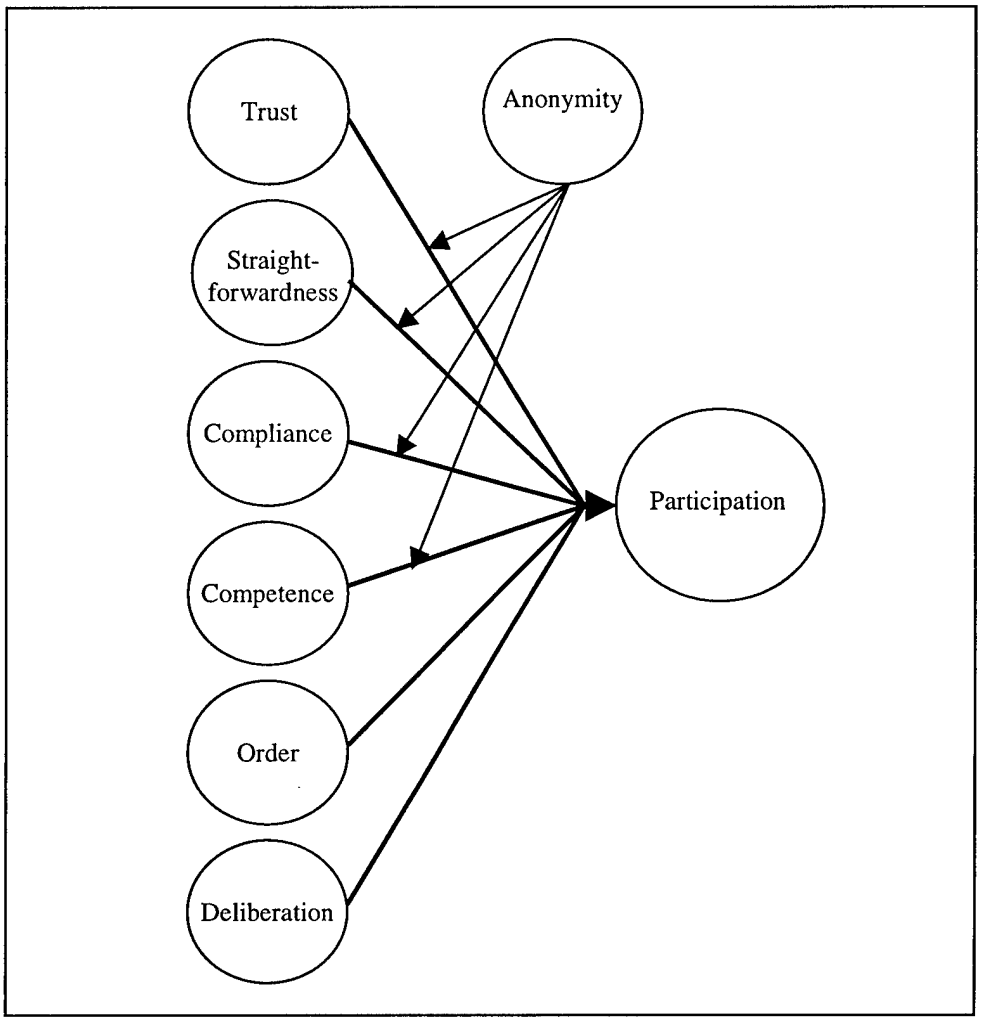


Figure 4: Personality Facet Model

2.6.2.1 Personality Facet: Trust (Personality Domain: Agreeableness)

Trust is the disposition to either believe or not believe that others are honest and well intentioned. Costa and McCrae (1992) state a trusting individual believes others are honest and have good intentions in mind. The untrusting individual assumes others are dishonest and are skeptical of their intentions.

Trust can enhance interpersonal skills (Aronoff and Wilson, 1985). The trusting person will be more willing to open up to others. Since they do trust others, they will be

able to facilitate the resolution of conflicts. The untrusting person would be skeptical of other's intentions in such a setting. This would be compounded if the untrusting person could not identify to whom they were conversing with. Therefore, they would be apprehensive about communicating in an anonymous setting.

> *Hypothesis* 3a: An individual with a high level of trust will provide more on-task comments than an individual with a low level of trust.
>
> *Hypothesis* 3b: An individual with a high level of trust will provide more affirmation comments than an individual with a low level of trust.
>
> *Hypothesis* 3c: Anonymity moderates the relationship between trust and participation such that an individual with a low level of trust will provide more on-task comments with a low level of anonymity than with a high level of anonymity.

2.6.2.2 Personality Facet: Straightforwardness (Personality Domain: Agreeableness)

Straightforwardness is the tendency to be straightforward and frank with others. Costa and McCrae (1992) identified the straightforward person as frank, sincere, and ingenious. The person that is not straightforward is willing to manipulate others through flattery, craftiness, or deception. They are also more likely to hold back their true feelings.

Groups go through various stages when attempting to complete group projects. Storming is one of these stages and takes place when group members are struggling to find the most effective means to reach a decision (Tuckman, 1965). During this phase the straightforward person will attempt to resolve the conflicts that will arise. Tensions may be high during this time, which would cause a person that is not straightforward to hold back. This person would be more willing to manipulate others if they were not

known. In this setting they could manipulate others opinions without fear of being identified by the others.

> *Hypothesis* 4a: An individual with a high level of straightforwardness will provide more on-task comments than an individual with a low level of straightforwardness.
>
> *Hypothesis* 4b: An individual with a high level of straightforwardness will provide more affirmation comments than an individual with a low level of straightforwardness.
>
> *Hypothesis* 4c: Anonymity moderates the relationship between straightforwardness and participation such that an individual with a low level of straightforwardness will provide more on-task comments with a high level of anonymity than with a low level of anonymity.

2.6.2.3 Personality Facet: Compliance (Personality Domain: Agreeableness)

Compliance is the willingness to cooperate with others in times of conflict. The compliant person will defer to others and they are not aggressive. Costa and McCrae (1992: 18) characterize them as "meek and mild". The non-compliant person is competitive, aggressive, and does not hesitate to show anger. They tend to be more confrontational than the compliant person.

The compliant person will want to avoid conflicts at all costs, but if put in that situation they will want to resolve them. If the conflicts persist they will become reserved and defer the resolution decisions to others. The non-compliant person will become aggressive and will feel they have to get their point across. The longer the conflict persists the more aggressive and competitive they will become.

> *Hypothesis* 5a: An individual with a low level of compliance will provide more on-task comments than an individual with a high level of compliance.
>
> *Hypothesis* 5b: An individual with a high level of compliance will provide more affirmation comments than an individual with a low level of compliance.

Hypothesis 5c: Anonymity moderates the relationship between compliance and participation such that an individual with a low level of compliance will provide more on-task comments with a high level of anonymity than with a low level of anonymity.

2.6.2.4 Personality Facet: Competence (Personality Domain: Conscientiousness)

Competence refers to the feeling of being prepared to handle whatever life has to offer (Costa and McCrae, 1992). The competent person feels confident about their abilities and capabilities. They know they can make adjustments as needed to be productive. They also know they have the ability to complete group activities (Guzzo, Yost, Campbell, and Shea, 1993). This also equates to being task-oriented. They have the ability and the desire to get the task completed and will work to that end. When a person believes they are not competent they are not confident about their abilities and capabilities. They feel they are often unprepared to handle what life may throw at them.

As with the conscientiousness domain, accountability is key to determining an individual's participation with this facet. A competent person will participate regardless of the accountability since they are confident about their abilities. The person that is not competent will hold back if they are being held accountable for their actions. If they are not held accountable they will be more willing to speak out.

Hypothesis 6a: An individual with a high level of competence will provide more on-task comments than an individual with a low level of competence.

Hypothesis 6b: An individual with a high level of competence will provide more affirmation comments than an individual with a low level of competence.

Hypothesis 6c: Anonymity moderates the relationship between competence and participation such that an individual with a low level of competence will provide more on-task comments with a high level of anonymity than with a low level of anonymity.

2.6.2.5 Personality Facet: Order (Personality Domain: Conscientiousness)

Order is the disposition to be neat, organized and methodical. The orderly person is one that is well organized and methodical in everything they do. They tend to keep things in their proper place (Costa and McCrae, 1992). If carried to an extreme they may become compulsive about their neatness. They would require things to be in their exact place in an organized manner that is suitable only to that individual. In contrast, the disorderly person cannot get organized. They have no clear method of accomplishing tasks and tend to be unmethodical in accomplishing those tasks.

Hypothesis 7a: An individual with a low level of order will provide more on-task comments than an individual with a high level of order.

Hypothesis 7b: Order will have no effect on the amount of affirmation comments.

Hypothesis 7c: Anonymity will have no moderating effect on order.

2.6.2.6 Personality Facet: Deliberation (Personality Domain: Conscientiousness)

Deliberation is "the tendency to think carefully before acting (Costa and McCrae, 1992)". The deliberate person is cautious and thinks things out before they act. They will carefully consider all of their actions. They may at times be slow in deciding what actions to take. The person that is not deliberate tends to be hasty. They act without thinking about their actions. They are also more spontaneous and can make quick decisions without requiring too much thought.

Hypothesis 8a: An individual with a low level of deliberation will provide more on-task comments than an individual with a high low level of deliberation.

Hypothesis 8b: Deliberation will have no effect on the amount of affirmation comments.

Hypothesis 8c: Anonymity will have no moderating effect on deliberation.

2.7 Summary

Anonymity in a GSS meeting has been offered as a means to improve participation, which in turn improves decision quality. To date this has not been proven through research. In fact, there is conflicting evidence as to what the actual effects of anonymity are. Research in social psychology provides us with a possible explanation for this. An individual's personality characteristics can effect how they participate in a decision-making meeting. The following chapters will provide statistical analysis to test the hypothesis that personality moderated by anonymity effects an individual's participation in a decision-making meeting.

III. Methodology

3.1 Introduction

As stated in chapter one, this study will evaluate how various levels of anonymity and individual personality types will effect participation in a decision-making meeting. This chapter describes how data were collected, quantified, and analyzed to test the hypothesized relationship between levels of anonymity and individual personality types.

This study was conducted in conjunction with three other GSS studies. The four studies researched different aspects of a GSS, but used the same experiment to collect data. One study evaluated the effects anonymity may have on group members' perceptions of the problem-solving environment, group consensus, and group decision quality. The next study evaluated the impact of process feedback and real-time feedback on the quantity of idea generation and the quality of decision-making in a GSS setting. The third study evaluated participants' ability to influence other members towards their solution to a problem-solving task.

This study and the three studies mentioned above required different data for the analysis. Therefore, some data collection was accomplished that was not required for this study. To reduce the confusion, aspects of the overall experiment that have no bearing on this particular study will not be discussed. For instance, one of the studies used a second problem-solving task to evaluate the impact of feedback. The data from the second task was not used for this study, so it will be discussed in minimal detail.

3.2 Experimental Design

This study used a fully randomized experiment to evaluate the influence of personality characteristics and levels of anonymity on a group-decision making team. Individuals were randomly assigned to a group, which consisted of four participants. The group was then randomly assigned to one of the three levels of anonymity (GSS with no labels and no placards, GSS with comment labels only, and GSS with comment labels and placards).

Each team was tasked to perform two problem-solving tasks, the Moon Scenario (Hall, 1971) and the Desert Scenario (Pond, unknown). This study used data from the Moon Scenario only. The scenarios are included in Appendix A and Appendix B. In each task, the team worked together to solve the problem. The number of comments each participant made was used to determine the level of participation.

The Moon Scenario task is a simple problem-solving task used to promote discussion among group members. In this scenario, the group was tasked to rank 15 items in order of most important to least important for the survival of the group. To accomplish the task, the group discussed the merits of each item, or how useful each item would be. Through this discussion, group members were to come to consensus on how the items should be ranked. There were no researcher-imposed requirements that mandated participation. Therefore, participants could choose to either participate or not participate in the discussion.

3.3 Equipment and Facilities

The experiments were conducted at the Air Force Institute of Technology (AFIT), Keesler Air Force Base (KAFB), and at various Air Force Reserve Officer Training Corps (AFROTC) detachments. All locations used for the experiment were educational institutions of some type (i.e. civilian institutions, Air Force training schools).

Existing classrooms were used for the experimental sessions. The rooms used for each session were laid out in a consistent manner to ensure they were largely identical for all locations. The room was divided into two sections. The first section, referred to as the preparation room, was used to provide instructions, conduct questionnaires and debrief the participants. The preparation room consisted of a table or group of tables put together similar to a conference room. The participants and facilitators all sat around the table. The second section, referred to as the task room, was used to complete the two problem solving tasks.

The GSS configuration used a mobile GSS that could be configured at each location. The system consisted of six Pentium based computers and one server configured with GroupSystems software running on a Windows 95 operating system. The room was set up similar to a conference room. The workstations were on tables that were set up perpendicular to a whiteboard. The facilitators sat at the opposite end of the white board. The facilitators used the layout provided by the GroupSystems software and a projector to display task related information and the group's decision results.

3.4 Participants

Of the 216 participants used for this study, junior Air Force officers accounted for 160 of the participants. The majority of the participants (116) were drawn from the Basic Communications Officer Training (BCOT) School located at Keesler Air Force Base, MS. The remaining participants were drawn from the Air Force Institute of Technology (AFIT) graduate student body located at Wright-Patterson Air Force Base, OH and various Air Force Reserve Officer Training Corps (AFROTC) detachments. The AFROTC participants consisted of college freshman through college senior students.

An ANOVA was conducted to determine if the location induced any bias. This analysis verified there was no discernable difference based on the location. Also, less than 5% of the participants had any prior knowledge or experience with a GSS.

Four participants were assigned to each group to ensure sufficient group participation in the problem-solving tasks. Table 2 provides a summary of demographic data for the participants. Table 3 provides a summary of computer use for the participants. All participants had used a computer for more than one year and most (180) use a computer more than 10 hours a week. Table 4 provides a summary of meeting preferences for the participants. All but ten of the participants had participated in a decision-making meeting, and 168 had participated in at least one per month.

Table 2: Demographics

Gender	
Male	170
Female	46

Education Level	
High School	3
Some College	54
Bachelors	100
Some Graduate	46
Graduate	13

Age	
Low	17
High	53
Mean	25.8

Marital Status	
Married	94
Single	122

Table 3: Participants Computer Use

Years of Use	
Less than 1	0
1-5	42
6-10	93
More than 10	81

Hours a Week	
0-10	36
11-20	72
21-30	58
More than 30	50

Table 4: Decision-making Meeting Participation

How often	
Daily	11
Weekly	54
Monthly	103
Yearly	38
Never	10

How you participate	
Sit back	1
Listen more than talk	86
Listen and talk equally	101
Talk more than listen	6
Take charge	18
Never participated	4

Preference	
Face-to-face	190
Tele-conference	1
Video conference	3
GSS	21
Other	1

3.5 Experiment Manipulations

Two experiment manipulation checks were performed for this study: anonymity and comment labeling. Anonymity was manipulated through the identification of comments made by participants. There were three levels of anonymity used for this study. The highest level of anonymity was attained through the use of a GSS meeting with comments and the participant "unlabeled". Participants would enter comments and they would be viewed without any labels identifying the author attached to the comments. For instance, in Figure 5 below, the comments are followed only by the date and time. This made it impossible for group members to know who had entered a comment.

Necessity and feasibility (on the moon) seem to be a good way to look at these items (9/ 7/00, 9:23 AM)

Survivability is of the utmost importances (9/ 7/00, 9:23 AM)

We can't survive very long without water (9/ 7/00, 9:24 AM)

What do we absolutely need to survive? Once we decide that we can move on to things we need to be rescued. (9/ 7/00, 9:25 AM)

Figure 5: Unlabeled Comments

The next level of anonymity had the comments labeled, but the author was not identified. With this manipulation each participant was assigned a color (Red, Blue, Green, and Yellow). When a comment was entered it was followed with a label with the corresponding color of that participant. An option in the GroupSystems software was

used to put a tag at the end of each comment. For instance, in Figure 6 below, the date, time, and a color follow the comments. The other members knew the color, but not who was assigned to that color. Thus, the participants would be able to address specific color-coded comments, but they would not know the particular individual associated with each color.

> Some of these things are useful to us here on earth....not on the moon (9/ 7/00, 11:47 AM, Red)
>
> The last one would be the gun--which would not be very beneficial--unless someone can think of another use for it (other than survival) (9/ 7/00, 11:48 AM, Blue)
>
> I think the compass--ooh, I thought the compass would still work--my bad (9/ 7/00, 11:49 AM, Green)
>
> I thought water and food (in that order) would be after air...we need to be able to sustain ourselves and deal with navigation next--if we're dead, a map won't do us any good (9/ 7/00, 11:49 AM, Yellow)

Figure 6: Labeled Comments

The lowest level of anonymity had both the comments labeled and the author labeled. The comments were labeled as before (Figure 6). Each participant also had a placard (a red, blue, green, or yellow sheet of paper) taped to his or her computer. The group members could then see the labeled comment and identify who entered the comment.

Experiment manipulation checks were included in the post-test survey given to all participants, which is attached in Appendix C. Each variable was measured with three

items using a seven-point Likert scale. In order to determine manipulation effectiveness, the means from groups who received the manipulation were compared to those groups that did not receive the manipulation. An Analysis of Variance (ANOVA) test was conducted to compare the difference between the means of the groups. The results of the two manipulation checks were successful and are described in the sections that follow.

3.5.1 Anonymity Manipulation

Anonymity was successfully manipulated through the three levels. The reliability analysis for the scale designed to check the anonymity manipulation resulted in a Cronbach's alpha of .87. The results of this analysis can be seen below in Table 5. An ANOVA was conducted to determine if there was a significant difference between the means for the three levels of anonymity. The results show there is a significant difference ($p < .001$) between the means. Table 6 shows the manipulation check was successful since participants felt their comments were less likely to be identified in a higher level of anonymity than in a lower level of anonymity.

Table 5: Reliability Analysis for the Anonymity Manipulation

	Mean	**Std Dev**	**Alpha**
Anonymity	**4.91**	**1.50**	**0.87**
I could recognize the originator of most comments.	4.80	1.84	
Other group members could connect me to the comments I made.	4.93	1.62	
Other group members knew when I made a contribution to the group.	5.07	1.57	

Table 6: Means and Standard Deviations for Manipulation of Anonymity

Anonymity Level	**Mean**	**Std Dev**
High - Comments unlabel with no placard	3.77	1.31
Med - Comments labeled with no placard	5.02	1.34
Low - Comments labeled with placard	5.84	1.08

Note – means are significantly different ($p < .001$)

3.5.2 Labeling Manipulation

Labeling was successfully manipulated through the three levels. The reliability analysis for the scale designed to measure this manipulation resulted in a Cronbach's alpha of .89. The results of this analysis can be seen below in Table 7. An ANOVA was conducted to determine if there was a significant difference between the means for the three levels of labeling. The results show there is a significant difference ($p < .001$) between the means. Table 8 shows the manipulation check was successful since participants who were exposed to labeled comments felt they could identify the participation level of other group members and other group members could identify their participation level.

Table 7: Reliability Analysis for the Labeling Manipulation

	Mean	**Std Dev**	**Alpha**
Labeling	**4.64**	**1.50**	**0.89**
I could tell if someone was sharing more information than other members of the group.	4.64	1.65	
I could tell if someone participated less than other members of the group.	4.47	1.70	
Other group members could judge the extent that I participated in the group.	4.73	1.62	

Table 8: Means and Standard Deviations for Manipulation of Labeling

Labeling Level	**Mean**	**Std Dev**
Comments unlabel with no placard	3.40	1.42
Comments labeled with no placard	5.09	1.15
Comments labeled with placard	5.28	1.25

Note – means are significantly different ($p < .001$)

3.6 Tasks and Procedures

There were two experimental administrators assigned to each session. One functioned as the facilitator and the other as an assistant. Procedures were written for each GSS session and are included in Appendix D.

Prior to the session, the equipment was configured to one of the three GSS levels of anonymity. The facilitator would configure the system while the assistant would put up the placards (if needed). Directions for configuring the system are included with the procedures written for the GSS meeting. As participants arrived they were asked to have a seat in the prep room. Once all four participants had arrived the experiment would begin.

Participants were welcomed and told the general purpose of the experiment. The assistant then gave them a folder containing a consent form (see Appendix E), a personality test, a demographics questionnaire, and a copy of the Moon Scenario. The facilitator instructed them to read the consent form, sign it, date it, and give it to the assistant. The assistant would collect them and place them in a separate folder containing only consent forms. The facilitator ensured them this is the only place they would be identified throughout the study.

Participants were then asked to complete the personality questionnaire and the demographics questionnaire. When they had completed the questionnaires they were to place them in the folder. When all the participants had completed the questionnaires they were asked to read the Moon Scenario and complete it individually. When finished they placed it in the folder. When all participants had completed the scenario the facilitator then gave an explanation of the group decision-making process and problem solving skills. Participants were told they should discuss the merits of each item and not focus on rank ordering the list. Participants were also informed that once they had completed their discussion they would be asked to individually rank order the list according to the group's decision. Participants were then asked to take their folders and move to the task room to complete the first task. They were asked to take their folders with them so the data could be identified for later labeling. The folders were unlabeled at this time to reduce the bias associated with their perception of anonymity.

Once in the task room, participants were told they could sit at any of the four workstations. The facilitator then gave the participants a short training session on how to use the GroupSystems software. The training session consisted of explaining the two tools they would be using, Categorizer and Vote, and a short decision making session. The Categorizer tool allows participants to add comments and view comments input by other users. The facilitator would also show the participants how to determine who submitted a comment (if a labeled session). The Vote tool allows participants to rank order the list of items. It is a drag and drop tool that the participants use to place the items in the order they want, then submit their vote. The individual votes are then combined into one list and are then displayed by the facilitator. Finally, the facilitator

told the participants to confine their discussion to the GSS and to not discuss the tasks verbally.

The short training session required participants to rank order a list of six names. The group is tasked with discussing possible ways the list can be ranked, such as alphabetic. The group was given five minutes to discuss the task. At the end of the five minutes or when they were through discussing the names, participants voted. The results of their vote were then displayed on the projector and discussed by the facilitator. The participants were given the opportunity to ask any questions about the software or procedures, but not about the scenarios. Throughout this brief training session, the assistant would walk around and provide assistance as needed.

Once the training session was complete, the facilitator instructed the participants that they would have 15 minutes to discuss the Moon Scenario. At the end of the 15 minutes they would rank the list and their results would be displayed. If they could not endorse the list they could have another five minutes to discuss the scenario and they would then revote. They were also instructed to limit their comments to the GSS software, which meant to not talk to each other. They were also told they would be notified when there were five and two minutes remaining. At this point the participants were invited into the Moon Scenario task and told to begin.

After 15 minutes of discussion or when the participants had finished discussing the task, the facilitator closed the session and instructed them it was time to rank order the list. The facilitator then opened the Voting tool in the GSS. The participants were then instructed to rank the list and submit their vote. Once all four participants had submitted their vote the facilitator displayed the results on the overhead. They were

asked if they could endorse the list as is or if they needed more time to discuss it. If they wanted more time to discuss the list they were given another five minutes. At the end of the five minutes they would then vote again. The results were then displayed again and they were told this would be their final list. They were then told they could take a five-minute break before they started the next task.

The remainder of the experiment was conducted to gather data for the other three studies. After the break, participants were given feedback and given the Desert Scenario. The Desert Scenario was administered in the same manner as the Moon Scenario. Once the Desert Scenario was completed the participants were given a questionnaire to collect data for constructs and manipulation checks for the other studies.

Once all participants had completed the questionnaire they were debriefed on the experiment. The facilitator conducted the debriefing by following the debriefing procedures. The participants were then allowed to leave. Once the participants had left, the facilitator and assistant gathered all the experiment data, labeled each item with the session number and the pre-assigned color of the participant, and put it into a large folder.

3.7 Measures

As stated earlier, this study is based on the supposition that manipulation of anonymity and an individual's personality characteristics will effect participation in a decision-making meeting. The first step taken in the operationalization of these constructs was to write a definition for each. The definitions follow in Table 9.

Table 9: Construct Definitions

Construct 1. Participation
Definition: The amount of contribution by a group member.

Construct 2. Agreeableness
Definition: Personality characteristic that is a dimension of interpersonal tendencies characterized by ones eagerness to help others and their belief others will help them in return.

Construct 3. Conscientiousness
Definition: Personality characteristic that is the process of planning, organizing, and carrying out tasks. The conscientious person is purposeful, strong-willed, and determined.

Participation. Participation was operationalized as the total number of comments submitted by a group member. Comments were split into two types of comments: "on task" and "affirmation". The on task comments were those relating to completing the scenario. The affirmation comments were responses to others comments affirming the comments made. These affirmations might be made because they agreed with the comment, disagreed with the comment, or understood the comment. In order to assess rater reliability, two researchers analyzed a subset of the comments. The squared correlation between the two raters over 40 participants was .93 indicating an acceptable level of rater reliability.

Agreeableness. Three facets of Agreeableness were measured using scales developed by Goldberg (1999). The scales measured the facets of Trust, Straightforwardness, and Compliance (Costa and McCrae, 1992).

Conscientiousness. Three facets of Conscientiousness were measured using scales developed by Goldberg (1999). The scales measured the facets of Competence, Order, and Deliberation (Costa and McCrae, 1992).

3.8 Questionnaire Design and Validation

There are different interpretations of the five-factor model. Because of this, there has been a wide variety of personality variables, or facets, that have been used to represent the five-factor structure. Of these, the Costa and McCrae model has been the most widely used and emulated. The Revised NEO Personality Inventory (NEO PI-R) developed by Costa and McCrae (1992) has been used as a framework for developing numerous other questionnaire scales (Goldberg et al., 1996).

The more popular of these measures were typically proprietary, which limited their availability. Goldberg attempted to develop measures that were not proprietary. He developed the International Personality Item Pool (IPIP) to bring the scientific community together "to develop and continually refine a broad-bandwidth personality inventory, whose items are in the public domain, and whose scales can be used for both scientific and commercial use (Goldberg, unknown). He developed a pool of 1,252 items that he dubbed the IPIP. From these, questionnaires could be developed to measure the trait-descriptive adjectives.

The proprietary questionnaires made it difficult to develop a questionnaire to test for specific domains or facets. The complete questionnaire had to be administered even if the researcher was only concerned with one domain or a few facets. Goldberg's measures made it possible to extract only those domains and/or facets of interest to the

researcher. This means a researcher can use the full set of questions for the specific domains and/or facets without administering the complete questionnaire.

The questionnaire used for this study was developed based on the work Goldberg (1999) did in developing the IPIP. Since the IPIP was developed to be available in the public domain, it was possible to avoid using proprietary measures. Also, other measures of the five-factor structure were developed to determine all five factors and all their facets in one lengthy test. The IPIP provides the questions needed to determine each facet, which makes it possible to test at the individual facet level. By using the IPIP the length of the questionnaire could be reduced by only testing for the six required facets (three for Agreeableness and three for Conscientiousness).

3.8 Questionnaire Design

The agreeableness construct and conscientiousness construct each used three measured variables described in Table 10 and Table 11 below, respectively. Each variable was measured with ten items using a five-point Likert scale. The final survey included 60 randomized items (6 measured variables * 10 questions each) and is included in Appendix F.

Table 10: Measured Variables – Construct 2

Construct 2. Agreeableness
Measured Variable 2a. Trust Definition: The disposition to either believe or not believe that others are honest and well intentioned.
Measured Variable 2b. Straightforwardness Definition: The propensity of an individual to be frank, sincere, and ingenious or their willingness to manipulate others through flattery, craftiness, or deception.
Measured Variable 2c. Compliance Definition: The willingness to work together for a common goal or purpose.

Table 11: Measured Variables – Construct 3

Construct 3. Conscientiousness
Measured Variable 3a. Competence Definition: The sense that one is capable, sensible, prudent, and effective.
Measured Variable 3b. Order Definition: The disposition to be neat, organized, and methodical.
Measured Variable 3c. Deliberation Definition: The tendency to think carefully before acting.

The questionnaire also collected demographic data and information on meeting preferences. This information was gathered to get an understanding of the participant's backgrounds. Demographic data was collected for age, gender, marital status, education level, and computer use. Meeting information was also collected to determine how many

meetings the participants participate in, how they participate, and the type of meetings they prefer.

3.8 Questionnaire Validation

Collected survey data was analyzed to ensure inter-item reliability. Data was coded to a spreadsheet and then assessed using SPSS 10.0 statistical software. The result was a correlation matrix, reliability coefficient, mean, and standard deviation for each set of questions by measured variable. Scale reliability was estimated by calculating the internal consistency of each multi-item scale as indexed by Cronbach's coefficient alpha□. The mean for each measured variable was calculated by dividing the grand mean by the number of items included in each measure.

The analysis was conducted first on the six measured variables, or facets. Since the facets are used to determine the factors (agreeableness and conscientiousness), the facet scales must be reliable. All facet scales achieved an acceptable reliability of .74 or greater as indexed by Chronbach's alpha with the exception of Trust (.63) and Order (.56). One item was deleted from the Trust scale and two items were deleted from the Order scale due to poor correlation with other items in the scale. Once these items were deleted they both achieved an acceptable reliability of .84 for Trust and .81 for Order. The actual items retained, means, standard deviations, and scale reliabilities are described in Table 12 (Agreeableness Domain: Trust, Straightforwardness, and Compliance) and Table 13 (Conscientiousness Domain: Competence, Order, and Deliberation).

Table 12: Reliability Analysis - Agreeableness Facets

Personality Domain Agreeableness	**Mean**	**Std Dev**	**Alpha**
Trust (Measured Variable 2a)	**3.81**	**0.270**	**0.84**
I trust others.	3.89	0.866	
I believe that others have good intentions.	3.93	0.747	
I trust what people say.	3.62	0.832	
I believe that people are basically moral.	3.71	0.930	
I believe in human goodness.	3.96	0.899	
I think that all will be well.	3.88	0.931	
I distrust people.	3.77	0.981	
I suspect hidden motives in others.	3.26	1.058	
I believe that people are essentially evil.	4.23	1.007	
Straightforwardness (Measured Variable 2b)	**4.04**	**0.539**	**0.77**
I would never cheat on my taxes.	4.58	0.742	
I stick to the rules.	4.03	0.789	
I use flattery to get ahead.	3.71	1.137	
I use others for my own ends.	4.08	0.940	
I know how to get around the rules.	2.90	1.059	
I cheat to get ahead.	4.73	0.618	
I put people under pressure.	3.53	1.048	
I pretend to be concerned for others.	4.25	0.977	
I take advantage of others.	4.27	0.924	
I obstruct others plans.	4.34	0.865	
Compliance (Measured Variable 2c)	**3.67**	**0.372**	**0.74**
I am easy to satisfy.	3.67	0.991	
I can't stand confrontations.	3.05	1.087	
I hate to seem pushy.	3.79	0.960	
I have a sharp tongue.	3.19	1.195	
I contradict others.	3.51	0.985	
I love a good fight.	3.63	1.264	
I yell at people.	4.17	0.963	
I insult people.	4.16	1.047	
I get back at others.	3.96	1.029	
I hold a grudge.	3.54	1.149	

Table 13: Reliability Analysis - Conscientiousness Facets

Personality Domain Consciensiousness	**Mean**	**Std Dev**	**Alpha**
Competence (Measured Variable 3a)	**4.17**	**0.225**	**0.78**
I complete tasks successfully.	4.46	0.551	
I excel in what I do.	4.30	0.593	
I handle tasks smoothly.	3.94	0.610	
I am sure of my ground.	4.11	0.700	
I come up with good solutions.	4.10	0.637	
I know how to get things done.	4.28	0.663	
I misjudge situations.	3.78	0.775	
I don't understand things.	3.98	0.948	
I have little to contribute.	4.45	0.721	
I don't see the consequences of things.	4.26	0.888	
Order (Measured Variable 3b)	**3.79**	**0.219**	**0.81**
I like order.	4.26	0.789	
I like to tidy up.	3.82	0.93	
I want everything to be "just right".	3.74	0.944	
I love order and regularity.	3.87	0.911	
I often forget to put things back in their proper place.	3.72	1.126	
I leave my belongings around.	3.62	1.187	
I am not bothered by messy people.	3.53	1.073	
I am not bothered by disorder.	3.79	1.067	
Deliberation (Measured Variable 3c)	**3.55**	**0.389**	**0.80**
I avoid mistakes.	3.91	0.810	
I choose my words with care.	3.64	0.913	
I stick to my chosen path.	3.53	0.894	
I jump into things without thinking.	3.68	0.978	
I make rash decisions.	3.99	0.869	
I like to act on a whim.	3.34	1.015	
I rush into things.	3.60	1.024	
I do crazy things.	3.28	1.215	
I act without thinking.	3.90	0.970	
I often make last-minute plans.	2.68	1.136	

Once it was determined the facet scales were reliable, analysis was conducted on the two constructs, or domains. Both domains achieved an acceptable reliability of .70 as indexed by Chronbach's alpha. The items, means, standard deviations, and scale reliabilities are described in Table 14.

Table 14: Reliability Analysis - Personality Domains

	Mean	Std Dev	Alpha
Agreeableness	**3.84**	**0.188**	**0.70**
Measured Variable 2a: Trust	3.81	0.627	
Measured Variable 2b: Straightforwardness	4.04	0.515	
Measured Variable 2c: Compliance	3.67	0.567	
Conscientiousness	**3.83**	**0.304**	**0.70**
Measured Variable 3a: Competence	4.17	0.410	
Measured Variable 3b: Order	3.79	0.681	
Measured Variable 3c: Deliberation	3.55	0.580	

3.9 Statistical Analysis

All of the hypotheses identified in Chapter II tested the basic premise that an individual's personality will effect their participation in a decision-making meeting. It was also hypothesized that anonymity would act as a moderator between some of the personality attributes and participation. In all cases, it must be shown a relationship exists between the personality attributes and participation.

The first step taken in the analysis of collected survey data was to separate the personality scores into percentiles. Costa and McCrae (1992) found it useful to separate scores into levels for analysis. Individual scores only show a degree to which an individual represents a personality trait. The higher or lower the score the greater the chance they will or will not display that trait. Individuals that score near the mean will

not have a strong tendency to display the trait. They concluded it is beneficial to investigate the effects for extreme scorers. They summarized their results in terms of five levels: very low, low, average, high, and very high. They found 7% of individuals score in both the very low and very high levels and 24% score in both the low and high level.

To more directly compare this study to the findings of Costa and McCrae (1992), the survey data will be analyzed at levels comparable to their breakdown. Figure 7 below shows the five levels and the percentiles that result from this breakdown. Two sets of percentiles were established based on their five levels. The first set of percentiles contained individuals that scored very low or very high within a personality characteristic. These scores were separated into the 7th percentile and scores above the 93rd percentile. This set will be referred to as the 7th/93rd percentile. The second set of percentiles contained individuals that scored very low, low, high and very high within a personality characteristic. These scores were separated into the 31st percentile and scores above the 69th percentile. This set will be referred to as the 31st/69th percentile.

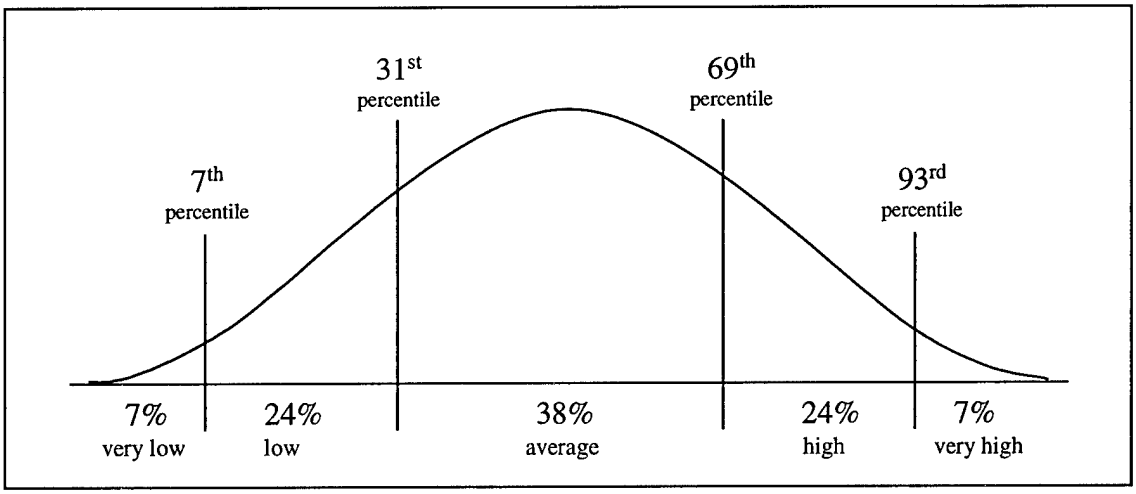


Figure 7: Five Levels of Personality Characteristics

Two *t*-tests were conducted to assess the statistical difference between two groups. A *t*-test generates a *t*-statistic, which is the ratio of the difference between the sample means to their standard error. If the *t*-statistic is low (below .05) then there is a significant statistical difference between the two means. If the *t*-statistic is relatively low (between .05 and .1) then there is a marginal statistical difference between the two means. The first *t*-test verified there was a difference between the upper and lower percentiles (7^{th}-93^{rd} and 31^{st}-69^{th}) for each personality domain and facet used in this study. The second *t*-test verified if there was a difference between the upper and lower percentiles for the level of participation by an individual.

ANOVAs were performed on the data collected during the experiment. An ANOVA uses data to compare several treatments in order to determine if they achieve different results. The ANOVA was used to determine if there were statistically reliable differences among the means due to personality characteristics, anonymity, or their interaction.

An ANOVA was conducted to determine if a significant difference existed between the three levels of anonymity. The ANOVA resulted in a significance of .024 between the three levels of anonymity. The results of a Bonferroni multiple comparisons for observed means can be seen below in Table 15. The results indicate there is a significant difference of .028 between a low level of anonymity and a medium level of anonymity. The difference between low to high (1.000) and medium to high (.145) was not significant. Table 16 provides statistics for the three levels of anonymity for all 216 participants. From this table it can be seen significantly more comments were made at the medium level of anonymity than at the low level of anonymity.

Table 15: Bonferroni Multiple Comparisons for Observed Means

ANON	ANON	Mean Difference	Std. Error	Sig.
High	Med	-2.93	1.4766	0.145
	Low	0.78	1.4766	1.000
Med	High	2.93	1.4766	0.145
	Low	3.71	1.4119	0.028
Low	High	-0.78	1.4766	1.000
	Med	-3.71	1.4119	0.028

Table 16: Experiment Descriptive Statistics

Anonymity Level	Comment Type	Comment Mean	Standard Deviation	Min	Max	N
Low L-P	On-Task	18.24	7.6818	6	41	76
	Affirmation	4.49	3.2021	0	13	76
Med L-NP	On-Task	21.95	9.4161	5	48	76
	Affirmation	4.36	3.0581	0	15	76
High NL-NP	On-Task	19.02	8.9611	2	42	64
	Affirmation	3.94	2.6420	0	12	64
Total	**On-Task**	**19.77**	**8.8159**	**2**	**48**	**216**
	Affirmation	**4.28**	**2.9894**	**0**	**15**	**216**

L-P = Label with Placard, L-NP = Labeled with no Placard, NL-NP = No Label and no Placard

Process and content anonymity can be found in the three levels of anonymity used for this study. Low anonymity has neither process nor content anonymity (members know exactly who has made a comment). Medium anonymity has process anonymity but no process anonymity (members know one of the other members is participating, but not which member). Finally, high anonymity has both process and content anonymity (members do not know who is contributing or who made a comment).

The high level of anonymity was not significantly different from the other levels of anonymity. The research literature on process and content anonymity provided explanations for the undesirable effects that can occur in a purely anonymous setting. Since it was not found to be significantly different and there are plausible explanations, the high level of anonymity will not be used in the analysis of the effects of anonymity.

An ANOVA was conducted to determine if there was a significant difference between the two levels of anonymity for both low and high scorers for each personality characteristic. This analysis was done to determine if anonymity was a moderator between personality characteristics and participation.

3.10 Summary

The purpose of this chapter was to describe the course of action by which an experiment was administered to investigate the influence of personality characteristics and various levels of anonymity have on an individual's participation in a group decision-making meeting. The chapter also explained and defined the constructs of participation, agreeableness, and conscientiousness. Chapter three further explained each of these constructs as a set of as measured variables, and described the specific process by which data were gathered to quantify each variable. Lastly, the chapter presents the statistical means by which the gathered data were analyzed to make conjecture as to the nature of the relationship between the independent variables of concern and process outcomes.

Results from this analysis are presented in Chapter IV, followed by an explanation of the results and recommendations for future research based on these findings in Chapter V.

IV. Analysis of Data

4.1 Introduction

This chapter provides a statistical analysis of the data collected during the experiment. Chapter five will present a more detailed description of the findings based on the previously mentioned hypothesis.

4.2 Difference Between Percentiles

After the data was separated into percentiles, comparisons were then made between scores at the low end and high end of each of the percentile pairs. Table 17 summarizes the results of a *t*-test to verify the difference between the upper and lower percentiles for each percentile pair within the two personality domains and six facets. These results confirm there is a significant difference between the upper and lower percentiles since they all had a significant difference of $p < .001$.

Table 17: Upper and Lower Percentiles

Characteristic	Percentile	N	Mean	Std Dev
Agreeableness	7th	16	2.83	0.2745
	93rd	16	4.57	0.1302
	31st	67	3.32	0.3381
	69th	66	4.31	0.1783
Conscientiousness	7th	16	2.84	0.3010
	93rd	15	4.57	0.1486
	31st	66	3.31	0.3228
	69th	65	4.32	0.1859
Trust	7th	11	2.27	0.1794
	93rd	14	4.80	0.1038
	31st	63	3.00	0.3910
	69th	65	4.46	0.2305
Straightforwardness	7th	15	2.93	0.2870
	93rd	12	4.89	0.0793
	31st	57	3.38	0.3294
	69th	54	4.66	0.1537
Compliance	7th	15	2.46	0.3247
	93rd	16	4.61	0.1340
	31st	56	2.94	0.3551
	69th	56	4.35	0.2089
Competence	7th	16	3.23	0.2845
	93rd	12	4.89	0.0900
	31st	60	3.66	0.3061
	69th	49	4.65	0.1609
Order	7th	15	2.24	0.3439
	93rd	8	4.94	0.0518
	31st	67	2.99	0.4783
	69th	64	4.54	0.2181
Deliberation	7th	15	2.41	0.2434
	93rd	14	4.57	0.1729
	31st	57	2.80	0.2897
	69th	56	4.25	0.2232

Note - all differences significant ($p < .001$)

4.3 Personality Domain Analysis

4.3.1 Agreeableness

4.3.1.1 Difference Between Levels of Agreeableness for On-Task Comments (Hypothesis 1a)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality domain of agreeableness for on-task comments can be seen below in Table 18. A chart depicting the participation can be seen in Figure 15 in Appendix G. The results of the *t*-test show there is a significant difference between low scorers and high scorers for agreeableness at the $31^{st}/69^{th}$ percentile ($p = .044$), but not at the $7^{th}/93^{rd}$ percentile (.484). This indicates individuals with a low level of agreeableness provide significantly more on-task comments than individuals with a high level of agreeableness.

Table 18: Agreeableness t-test for On-Task Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	16	19.81	9.2967	0.484
	High	16	19.69	8.6927	
31^{st} / 69^{th}	Low	67	20.78	9.5391	0.044
	High	66	18.26	7.2267	

4.3.1.2 Difference Between Levels of Agreeableness for Affirmation Comments (Hypothesis 1b)

The summary results of a *t*-test to determine if a significant difference exists between low and high scorers on the personality domain of agreeableness for affirmation

comments can be seen below in Table 19. A chart depicting the participation can be seen in Figure 16 in Appendix G. The results of the *t*-test show there is no significant difference between low scorers and high scorers for agreeableness at either the $7^{th}/93^{rd}$ percentile ($p = .147$) or the $31^{st}/93^{rd}$ percentile ($p = .430$). This indicates an individual's level of agreeableness does not predict their level of participation for affirmation comments.

Table 19: Agreeableness t-test for Affirmation Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	16	3.44	2.2500	0.147
	High	16	4.38	2.7049	
31^{st} / 69^{th}	Low	67	4.25	3.0617	0.430
	High	66	4.17	2.6636	

4.3.1.3 Anonymity as a Moderator of Agreeableness and Participation (Hypothesis 1c)

The summary results of an ANOVA to determine if a significant difference exists between a low level of anonymity and a medium level of anonymity for both low and high scorers on the personality domain of agreeableness for on-task comments can be seen below in Table 20. The analysis determines if anonymity moderates the relationship between either a low or high scorer for agreeableness and their participation level. The results of the ANOVA show there is a significant difference between the two levels of anonymity for a low scorer for agreeableness at both the $7^{th}/93^{rd}$ percentile ($p = .007$) and the $31^{st}/69^{th}$ percentile ($p = .008$). The results also show there is not a significant difference between the two levels of anonymity for a high scorer for agreeableness at

both the $7^{th}/93^{rd}$ percentile (p = .471) and the $31^{st}/69^{th}$ percentile (p = .299). This indicates individuals with both a low and very low level of agreeableness provide significantly more on-task comments in a medium level of anonymity than in a low level of anonymity. The results for both percentile levels can be seen below in Figure 8.

Table 20: Agreeableness with Anonymity as a Moderator

Percentile	Level of Agreeableness	Level of Anonymity	Mean	Std Dev	N	Sig.
7^{th} / 93^{rd}	Low	Med	24.33	3.7238	6	0.007
		Low	16.00	3.4641	3	
	High	Med	20.00	9.8489	3	0.471
		Low	20.43	7.7644	7	
31^{st} / 69^{th}	Low	Med	24.27	9.5128	22	0.008
		Low	17.42	7.6035	19	
	High	Med	19.40	8.0616	20	0.299
		Low	18.25	6.3056	24	

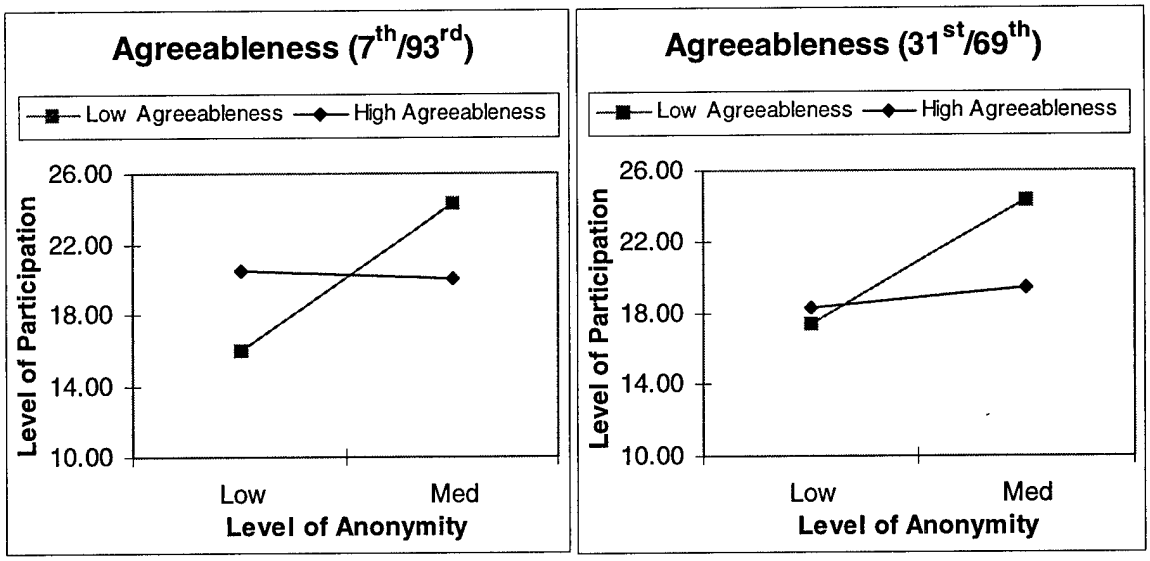


Figure 8: Agreeableness moderated by anonymity at both percentiles

4.3.2 Conscientiousness

4.3.2.1 Difference Between Levels of Conscientiousness for On-Task Comments (Hypothesis 2a)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality domain of conscientiousness for on-task comments can be seen below in Table 21. A chart depicting the participation can be seen in Figure 17 in Appendix G. The results of the *t*-test show there is no significant difference between low scorers and high scorers for conscientiousness at either the $7^{th}/93^{rd}$ percentile ($p = .142$) or the $31^{st}/93^{rd}$ percentile ($p = .332$). This indicates an individual's level of conscientiousness does not predict their level of participation for on-task comments.

Table 21: Conscientiousness t-test for On-Task Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	16	18.81	5.9578	0.142
	High	15	15.93	8.5813	
31^{st} / 69^{th}	Low	66	20.06	7.6216	0.332
	High	65	19.40	9.6174	

4.3.2.2 Difference Between Levels of Conscientiousness for Affirmation Comments (Hypothesis 2b)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality domain of conscientiousness for affirmation comments can be seen below in Table 22. A chart depicting the participation

can be seen in Figure 18 in Appendix G. The results of the *t*-test show there is a marginally significant difference between low scorers and high scorers for conscientiousness at the $7^{th}/93^{rd}$ percentile (p = .093), but no difference at the $31^{st}/69^{th}$ percentile (.245). This indicates individuals with a very high level of conscientiousness provide marginally more affirmation comments than individuals with a very low level of conscientiousness.

Table 22: Conscientiousness t-test for Affirmation Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	16	3.81	2.8100	0.093
	High	15	5.07	2.3135	
31^{st} / 69^{th}	Low	66	4.09	3.0318	0.245
	High	65	4.43	2.5798	

4.3.2.3 Anonymity as a Moderator of Conscientiousness and Participation (Hypothesis 2c)

The summary results of an ANOVA to determine if a significant difference exists between a low level of anonymity and a medium level of anonymity for both low and high scorers on the personality domain of conscientiousness for on-task comments can be seen below in Table 23. The analysis determines if anonymity moderates the relationship between either a low or high scorer for conscientiousness and their participation level. The results of the ANOVA show there is a significant difference between the two levels of anonymity for a low scorer for conscientiousness at both the $7^{th}/93^{rd}$ percentile (p = .050) and the $31^{st}/69^{th}$ percentile (p = .035). The results also show there is not a

significant difference between the two levels of anonymity for a high scorer for conscientiousness at both the $7^{th}/93^{rd}$ percentile (p = .185) and the $31^{st}/69^{th}$ percentile (p = .479). This indicates individuals with a very low and low level of conscientiousness provide significantly more on-task comments in a medium level of anonymity than in a low level of anonymity. The results for both percentile levels can be seen in Figure 9.

Table 23: Conscientiousness with Anonymity as a Moderator

Percentile	Level of Conscientiousness	Level of Anonymity	Mean	Std Dev	N	Sig.
7^{th} / 93^{rd}	Low	Med	21.25	6.6708	8	0.050
		Low	15.40	3.5777	5	
	High	Med	13.43	8.8855	7	0.185
		Low	18.60	10.0896	5	
31^{st} / 69^{th}	Low	Med	22.71	7.6923	24	0.035
		Low	18.74	6.9819	23	
	High	Med	19.00	9.7094	23	0.479
		Low	19.14	8.3981	21	

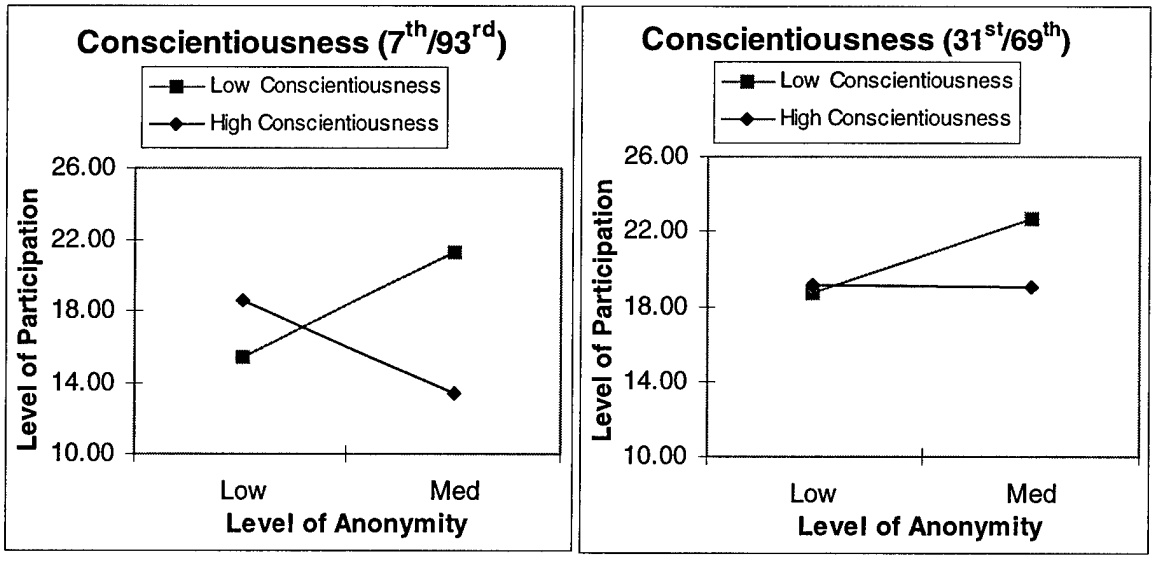


Figure 9: Conscientiousness moderated by anonymity at both percentiles

4.4 Personality Facet Analysis

4.4.1 Trust

4.4.1.1 Difference Between Levels of Trust for On-Task Comments (Hypothesis 3a)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of trust for on-task comments can be seen below in Table 24. A chart depicting the participation can be seen in Figure 19 in Appendix G. The results of the *t*-test show there is no significant difference between low scorers and high scorers for trust at either the $7^{th}/93^{rd}$ percentile ($p = .182$) or the $31^{st}/93^{rd}$ percentile ($p = .413$). This indicates an individual's level of trust does not predict their level of participation for on-task comments.

Table 24: Trust t-test for On-Task Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	11	20.27	9.4243	0.182
	High	14	19.50	8.0742	
31^{st} / 69^{th}	Low	63	18.51	8.4393	0.413
	High	65	19.83	8.3396	

4.4.1.2 Difference Between Levels of Trust for Affirmation Comments (Hypothesis 3b)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of trust for affirmation comments can be seen below in Table 25. A chart depicting the participation can be seen in Figure 20 in Appendix G. The results of the *t*-test show there is no significant difference between low scorers and high scorers for trust at either the $7^{th}/93^{rd}$ percentile ($p = .361$) or

the 31st/93rd percentile (p = .198). This indicates an individual's level of trust does not predict their level of participation for affirmation comments.

Table 25: Trust t-test for Affirmation Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7th / 93rd	Low	11	3.45	3.4165	0.361
	High	14	3.86	2.1788	
31st / 69th	Low	63	4.03	2.9998	0.198
	High	65	4.49	3.1030	

4.4.1.3 Anonymity as a Moderator of Trust and Participation (Hypothesis 3c)

The summary results of an ANOVA to determine if a significant difference exists between a low level of anonymity and a medium level of anonymity for both low and high scorers on the personality facet of trust for on-task comments can be seen below in Table 26. The analysis determines if anonymity moderates the relationship between either a low or high scorer for trust and their participation level. The results of the ANOVA show there is a significant difference between the two levels of anonymity for a low scorer for trust at the 7th/93rd percentile (p = .037), but not at the 31st/39th percentile (p = .191). The results also show there is not a significant difference between the two levels of anonymity for a high scorer for trust at both the 7th/93rd percentile (p = .450) and the 31st/69th percentile (p = .103). This indicates individuals with a very low level of trust provide significantly more on-task comments in a medium level of anonymity than in a low level of anonymity. The results for the 7th/93rd percentile can be seen below in Figure 10. Results for the 31st/69th percentile can be seen in Figure 31 in Appendix H.

Table 26: Trust with Anonymity as a Moderator

Percentile	Level of Trust	Level of Anonymity	Mean	Std Dev	N	Sig.
7^{th} / 93^{rd}	Low	Med	23.50	4.5092	4	0.037
		Low	14.33	6.3509	3	
	High	Med	19.67	5.5076	3	0.450
		Low	19.00	7.6811	5	
31^{st} / 69^{th}	Low	Med	19.73	6.6274	22	0.191
		Low	17.68	8.1653	19	
	High	Med	22.30	10.3827	20	0.103
		Low	19.08	6.3108	25	

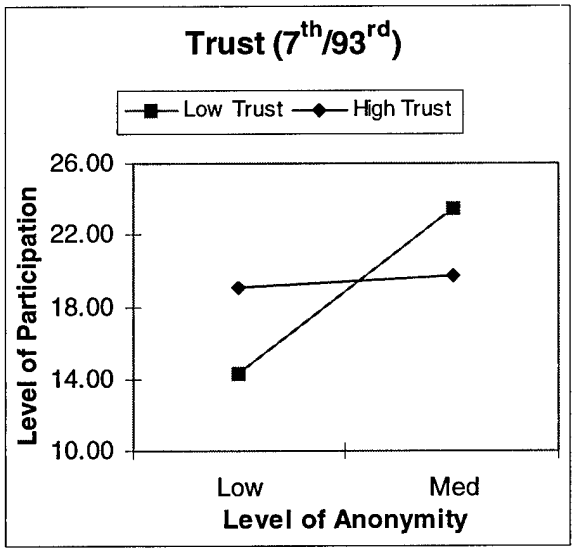


Figure 10: Trust moderated by anonymity at the 7^{th}/93^{rd} percentile

4.4.2 Straightforwardness

4.4.2.1 Difference Between Levels of Straightforwardness for On-Task Comments (Hypothesis 4a)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of straightforwardness for on-task comments can be seen below in Table 27. A chart depicting the participation can be seen in Figure 21 in Appendix G. The results of the *t*-test show there is no significant difference between low scorers and high scorers for straightforwardness at either the $7^{th}/93^{rd}$ percentile ($p = .404$) or the $31^{st}/69^{th}$ percentile ($p = .190$). This indicates an individual's level of straightforwardness does not predict their level of participation for on-task comments.

Table 27: Straightforwardness t-test for On-Task Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	15	19.93	7.0657	0.404
	High	12	19.33	5.2107	
31^{st} / 69^{th}	Low	57	20.26	8.3185	0.190
	High	54	18.93	7.6722	

4.4.2.2 Difference Between Levels of Straightforwardness for Affirmation Comments (Hypothesis 4b)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of straightforwardness for on-task comments can be seen below in Table 28. A chart depicting the participation can be seen in Figure 22 in Appendix G. The results of the *t*-test show there is a significant

difference between low scorers and high scorers for straightforwardness at the $7^{th}/93^{rd}$ percentile (p = .019) and a marginally significant difference at the $31^{st}/69^{th}$ percentile (p = .052). This indicates individuals with a high and very high level of straightforwardness provide significantly more affirmation comments than individuals with a low or very low level of straightforwardness.

Table 28: Straightforwardness t-test for Affirmation Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	15	2.73	1.6676	0.019
	High	12	4.92	2.9987	
31^{st} / 69^{th}	Low	57	4.07	3.0464	0.052
	High	54	5.04	3.1680	

4.4.2.3 Anonymity as a Moderator of Straightforwardness and Participation (Hypothesis 4c)

The summary results of an ANOVA to determine if a significant difference exists between a low level of anonymity and a medium level of anonymity for both low and high scorers on the personality facet of straightforwardness for on-task comments can be seen below in Table 29. The analysis determines if anonymity moderates the relationship between either a low or high scorer for straightforwardness and their participation level. The results of the ANOVA show there is a significant difference between the two levels of anonymity for a low scorer for straightforwardness at the $7^{th}/93^{rd}$ percentile (p = 008), but not at the $31^{st}/69^{th}$ percentile (p = .106). The results also show there is not a significant difference between the two levels of anonymity for a high scorer for straightforwardness at both the $7^{th}/93^{rd}$ percentile (p = .332) and the $31^{st}/69^{th}$ percentile (p

= .226). This indicates individuals with a very low level of straightforwardness provide significantly more on-task comments in a medium level of anonymity than in a low level of anonymity. The results for the 7th/93rd percentile can be seen below in Figure 11. The results for the 31st/69th percentile can be seen in Figure 32 in Appendix H.

Table 29: Straightforwardness with Anonymity as a Moderator

Percentile	Level of Straightforwardness	Level of Anonymity	Mean	Std Dev	N	Sig.
7th / 93rd	Low	Med	24.75	4.2720	4	0.008
		Low	16.00	4.6904	6	
	High	Med	19.25	7.0887	4	0.332
		Low	21.25	5.1235	4	
31st / 69th	Low	Med	22.60	8.0092	20	0.106
		Low	19.33	7.8441	18	
	High	Med	19.61	8.2258	18	0.226
		Low	18.27	5.8731	22	

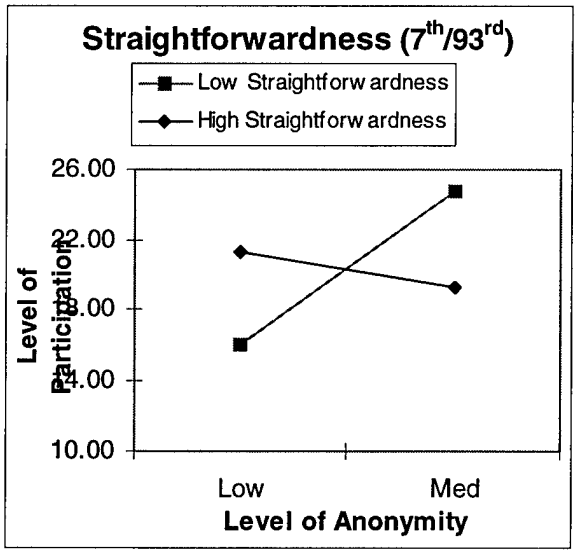


Figure 11: Straightforwardness moderated by anonymity at the 7th/93rd percentile

4.4.3 Compliance

4.4.3.1 Difference Between Levels of Compliance for On-Task Comments (Hypothesis 5a)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of compliance for on-task comments can be seen below in Table 30. A chart depicting the participation can be seen in Figure 23 in Appendix G. The results of the *t*-test show there is a significant difference between low scorers and high scorers for compliance at the $31^{st}/69^{th}$ percentile ($p = .007$), but not at the $7^{th}/93^{rd}$ percentile ($p = .324$). This indicates individuals with a low level of compliance provide significantly more on-task comments than individuals with a high level of compliance.

Table 30: Compliance t-test for On-Task Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	15	18.67	9.7150	0.324
	High	16	17.31	6.3950	
31^{st} / 69^{th}	Low	56	21.79	9.7341	0.007
	High	56	17.70	7.4221	

4.4.3.2 Difference Between Levels of Compliance for Affirmation Comments (Hypothesis 5b)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of compliance for on-task comments can be seen below in Table 31. A chart depicting the participation can be seen in Figure 24 in Appendix G. The results of the *t*-test show there is a significant difference between low scorers and high scorers for compliance at both the $7^{th}/93^{rd}$

percentile (p = .044) and the 31st/69th percentile (p = .48). The results contradict each other since individuals with a very high level of compliance will provide significantly more affirmation comments than individuals with a very low level of compliance. The opposite is true at the 31st/69th percentile; individuals with a low level of compliance will provide significantly more affirmation comments than individuals with a high level of compliance.

Table 31: Compliance t-test for Affirmation Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7th / 93rd	Low	15	3.13	2.0999	0.044
	High	16	4.75	2.8868	
31st / 69th	Low	56	4.66	3.4865	0.048
	High	56	3.70	2.5148	

4.4.3.3 Anonymity as a Moderator of Compliance and Participation (Hypothesis 5c)

The summary results of an ANOVA to determine if a significant difference exists between a low level of anonymity and a medium level of anonymity for both low and high scorers on the personality facet of compliance for on-task comments can be seen below in Table 32. The analysis determines if anonymity moderates the relationship between either a low or high scorer for compliance and their participation level. The results of the ANOVA show there is a significant difference between the two levels of anonymity for a low scorer for compliance at both the 7th/93rd percentile (p = .017) and the 31st/69th percentile (p = .002). The results also show there is a marginally significant difference between the two levels of anonymity for a high scorer for compliance at the 31st/69th percentile (p = .063), but no significance at the 7th/93rd percentile (p = .389).

This indicates individuals at both the very low and low levels of compliance will provide significantly more on-task comments in a medium level of anonymity than in a low level of anonymity. Also, individuals with a high level of compliance will provide marginally more on-task comments in a medium level of anonymity than in a low level of anonymity. The results for both percentile levels can be seen below in Figure 12.

Table 32: Compliance with Anonymity as a Moderator

Percentile	Level of Competence	Level of Anonymity	Mean	Std Dev	N	Sig.
7th / 93rd	Low	Med	22.50	4.9699	6	0.017
		Low	14.50	4.7958	4	
	High	Med	17.40	6.0249	5	0.389
		Low	18.57	7.4130	7	
31st / 69th	Low	Med	25.76	9.3590	21	0.002
		Low	17.65	6.9637	17	
	High	Med	20.22	8.0407	18	0.063
		Low	16.50	6.0900	18	

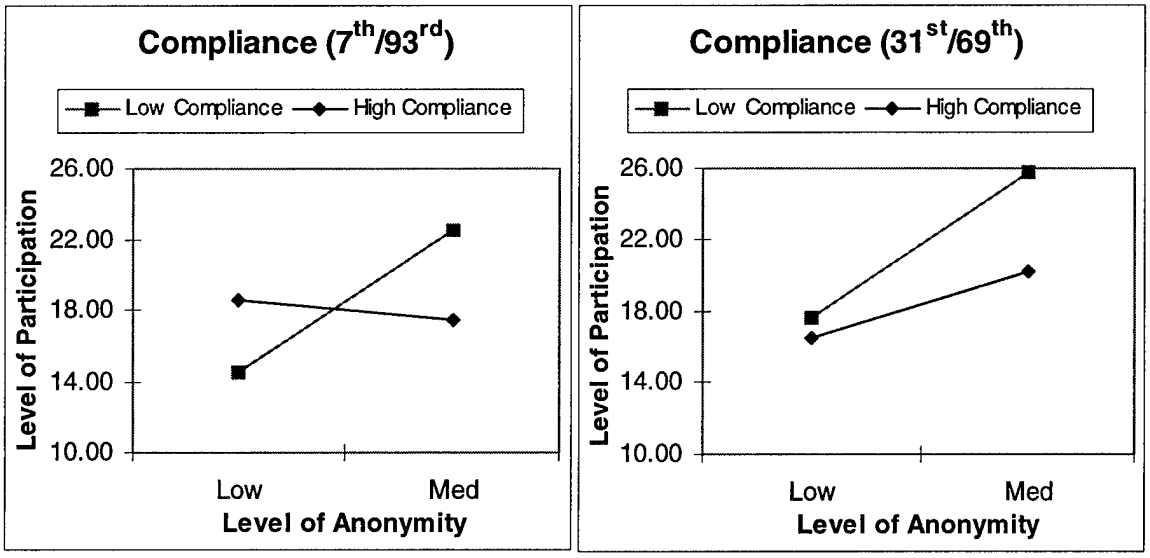


Figure 12: Compliance moderated by anonymity at both percentiles

4.4.4 Competence

4.4.4.1 Difference Between Levels of Competence for On-Task Comments (Hypothesis 6a)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of competence for on-task comments can be seen below in Table 33. A chart depicting the participation can be seen in Figure 25 in Appendix G. The results of the *t*-test show there is a significant difference between low scorers and high scorers for competence at the $7^{th}/93^{rd}$ percentile ($p = .040$), and a marginally significant difference at the $31^{st}/69^{th}$ percentile ($p = .089$). This indicates individuals with a very high level of competence provide significantly more on-task comments than individuals with a very low level of competence. Also, individuals with a high level of competence provide marginally more on-task comments than individuals with a low level of competence.

Table 33: Competence t-test for On-Task Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	16	15.94	7.1318	0.040
	High	12	22.33	11.4283	
31^{st} / 69^{th}	Low	60	17.62	6.9917	0.089
	High	49	19.80	9.3005	

4.4.4.2 Difference Between Levels of Competence for Affirmation Comments (Hypothesis 6b)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of competence for affirmation

comments can be seen below in Table 34. A chart depicting the participation can be seen in Figure 26 in Appendix G. The results of the *t*-test show there is a significant difference between low scorers and high scorers for competence at the $31^{st}/69^{th}$ percentile ($p = .001$), but not at the $7^{th}/93^{rd}$ ($p = .120$). This indicates individuals with a high level of competence provide significantly more affirmation comments than individuals with a low level of competence.

Table 34: Competence t-test for Affirmation Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	16	3.50	2.2804	0.120
	High	12	4.50	2.0226	
31^{st} / 69^{th}	Low	60	3.37	2.1390	0.001
	High	49	5.04	3.2013	

4.4.4.3 Anonymity as a Moderator of Competence and Participation (Hypothesis 6c)

The summary results of an ANOVA to determine if a significant difference exists between a low level of anonymity and a medium level of anonymity for both low and high scorers on the personality facet of competence for on-task comments can be seen below in Table 35. The analysis determines if anonymity moderates the relationship between either a low or high scorer for competence and their participation level. The results of the ANOVA show there is not a significant difference between the two levels of anonymity for a low scorer for competence at either the $7^{th}/93^{rd}$ percentile ($p = .230$) or the $31^{st}/69^{th}$ percentile ($p = .198$). The results also show there is a marginally significant difference between the two levels of anonymity for a high scorer for competence at the

$7^{th}/93^{rd}$ percentile (p = .074), but no significance at the $31^{st}/69^{th}$ percentile (p = .205). This indicates individuals with a very high level of competence provide significantly more on-task comments in a medium level of anonymity than in a low level of anonymity. The results for the $7^{th}/93^{rd}$ percentile can be seen below in Figure 13. The results for the $31^{st}/69^{th}$ percentile can be seen in Figure 33 in Appendix H.

Table 35: Competence with Anonymity as a Moderator

Percentile	Level of Competence	Level of Anonymity	Mean	Std Dev	N	Sig.
7^{th} / 93^{rd}	Low	Med	18.71	7.8255	7	0.230
		Low	15.00	3.0000	3	
	High	Med	22.60	9.8133	5	0.074
		Low	12.67	3.2146	3	
31^{st} / 69^{th}	Low	Med	19.16	7.4815	25	0.198
		Low	17.24	6.6099	17	
	High	Med	20.76	9.7566	17	0.205
		Low	18.28	7.8050	18	

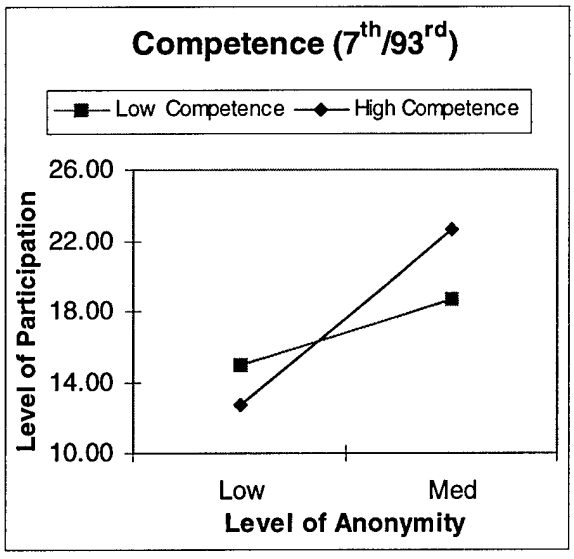


Figure 13: Competence moderated by anonymity at the $7^{th}/93^{rd}$ percentile

4.4.5 Order

4.4.5.1 Difference Between Levels of Order for On-Task Comments (Hypothesis 7a)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of order for on-task comments can be seen below in Table 36. A chart depicting the participation can be seen in Figure 27 in Appendix G. The results of the *t*-test show there is a significant difference between low scorers and high scorers for order at the $7^{th}/93^{rd}$ percentile ($p = .048$), but not at the $31^{st}/69^{th}$ percentile ($p = .212$). This indicates individuals with a very low level of order provide significantly more on-task comments than individuals with a very high level of order.

Table 36: Order t-test for On-Task Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	15	20.20	7.8486	0.048
	High	8	14.38	7.1302	
31^{st} / 69^{th}	Low	67	20.06	7.5996	0.212
	High	64	18.89	9.0222	

4.4.5.2 Difference Between Levels of Order for Affirmation Comments (Hypothesis 7b)

The summary results of a t-test to determine if a significant difference exists between low and high scorers on the personality facet of order for affirmation comments can be seen below in Table 37. A chart depicting the participation can be seen in Figure 28 in Appendix G. The results of the t-test show there is no significant difference between low scorers and high scorers for order at either the $7^{th}/93^{rd}$ percentile ($p = .476$)

or the 31st/69th percentile (p = .117). This indicates an individual's level of order does not predict their level of participation for affirmation comments.

Table 37: Order t-test for Affirmation Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7th / 93rd	Low	15	4.40	3.5817	0.476
	High	8	4.50	4.3753	
31st / 69th	Low	67	3.96	3.0819	0.117
	High	64	4.78	2.8921	

4.4.5.3 Anonymity as a Moderator of Order and Participation (Hypothesis 7c)

The summary results of an ANOVA to determine if a significant difference exists between a low level of anonymity and a medium level of anonymity for both low and high scorers on the personality facet of order for on-task comments can be seen below in Table 38. The analysis determines if anonymity moderates the relationship between either a low or high scorer for order and their participation level. The results of the ANOVA show there is no significant difference between the two levels of anonymity for both low and high scorers for order at either the 7th/93rd percentile (p = .378) or 31st/69th percentile (p = .360). The results also show there is not a significant difference between the two levels of anonymity for a high scorer for order at both the 7th/93rd percentile (p = .472) and the 31st/69th percentile (p = .396). This indicates the level of anonymity has no effect on participation for order. The results for both percentile levels can be seen in Figure 34 in Appendix H.

Table 38: Order with Anonymity as a Moderator

Percentile	Level of Order	Level of Anonymity	Mean	Std Dev	N	Sig.
7^{th} / 93^{rd}	Low	Med	20.14	6.5683	7	0.378
		Low	22.00	13.0894	4	
	High	Med	16.00	8.4853	2	0.472
		Low	16.50	7.7244	4	
31^{st} / 69^{th}	Low	Med	20.65	8.0346	26	0.360
		Low	19.87	7.0666	23	
	High	Med	18.11	9.6582	18	0.396
		Low	18.77	7.4495	30	

4.4.6 Deliberation

4.4.6.1 Difference Between Levels of Deliberation for On-Task Comments (Hypothesis 8a)

The summary results of a *t*-test to determine if a significant difference exists between high and low scorers on the personality facet of deliberation for on-task comments can be seen below in Table 39. A chart depicting the participation can be seen in Figure 29 in Appendix G. The results of the *t*-test show there is a significant difference between low scorers and high scorers for deliberation at the $7^{th}/93^{rd}$ percentile ($p = .016$), but not at the $31^{st}/69^{th}$ percentile ($p = .107$). This indicates individuals with a very low level of deliberation provide significantly more on-task comments than individuals with a very high level of deliberation.

Table 39: Deliberation t-test for On-Task Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	15	19.33	8.8048	0.016
	High	14	13.07	5.8107	
31^{st} / 69^{th}	Low	57	19.33	7.0059	0.107
	High	56	17.54	8.2285	

4.4.6.2 Difference Between Levels of Deliberation for Affirmation Comments (Hypothesis 8b)

The summary results of a t-test to determine if a significant difference exists between low and high scorers on the personality facet of deliberation for affirmation comments can be seen below in Table 40. A chart depicting the participation can be seen in Figure 30 in Appendix G. The results of the *t*-test show there is no significant

difference between low scorers and high scorers for deliberation at either the $7^{th}/93^{rd}$ percentile ($p = .169$) or the $31^{st}/69^{th}$ percentile ($p = .175$). This indicates an individual's level of deliberation does not predict their level of participation for affirmation comments.

Table 40: Deliberation t-test for Affirmation Comments

Percentile	Level	N	Mean	Std Dev	Sig.
7^{th} / 93^{rd}	Low	15	4.27	2.9147	0.169
	High	14	3.36	1.9848	
31^{st} / 69^{th}	Low	57	4.44	2.9941	0.175
	High	56	3.96	2.3430	

4.4.6.3 Anonymity as a Moderator of Deliberation and Participation (Hypothesis 8c)

The summary results of an ANOVA to determine if a significant difference exists between a low level of anonymity and a medium level of anonymity for both low and high scorers on the personality facet of deliberation for on-task comments can be seen on the next page in Table 41. The analysis determines if anonymity moderates the relationship between either a low or high scorer for deliberation and their participation level. The results of the ANOVA show there is a significant difference between the two levels of anonymity for a low scorer for deliberation at both the $7^{th}/93^{rd}$ percentile ($p = .018$) and the $31^{st}/69^{th}$ percentile ($p = .002$). The results also show there is a significant difference between the two levels of anonymity for a high scorer for deliberation at the $7^{th}/93^{rd}$ percentile ($p = .076$), but not at the $31^{st}/69^{th}$ percentile ($p = .450$). The results indicate individuals with both a very low and low level of deliberation will provide

significantly more on-task comments in a medium level of anonymity than in a low level of anonymity. Also, individuals with a very high level of deliberation will provide marginally more on-task comments in a low level of anonymity than in a medium level of anonymity. The results for both percentile levels can be seen below in Figure 14.

Table 41: Deliberation with Anonymity as a Moderator

Percentile	Level of Deliberation	Level of Anonymity	Mean	Std Dev	N	Sig.
7^{th} / 93^{rd}	Low	Med	28.50	9.8826	4	0.018
		Low	16.60	3.1305	5	
	High	Med	9.67	4.2740	6	0.076
		Low	15.75	8.0156	4	
31^{st} / 69^{th}	Low	Med	22.84	8.0296	19	0.002
		Low	16.96	4.6854	23	
	High	Med	18.17	8.7609	24	0.450
		Low	18.54	8.2221	13	

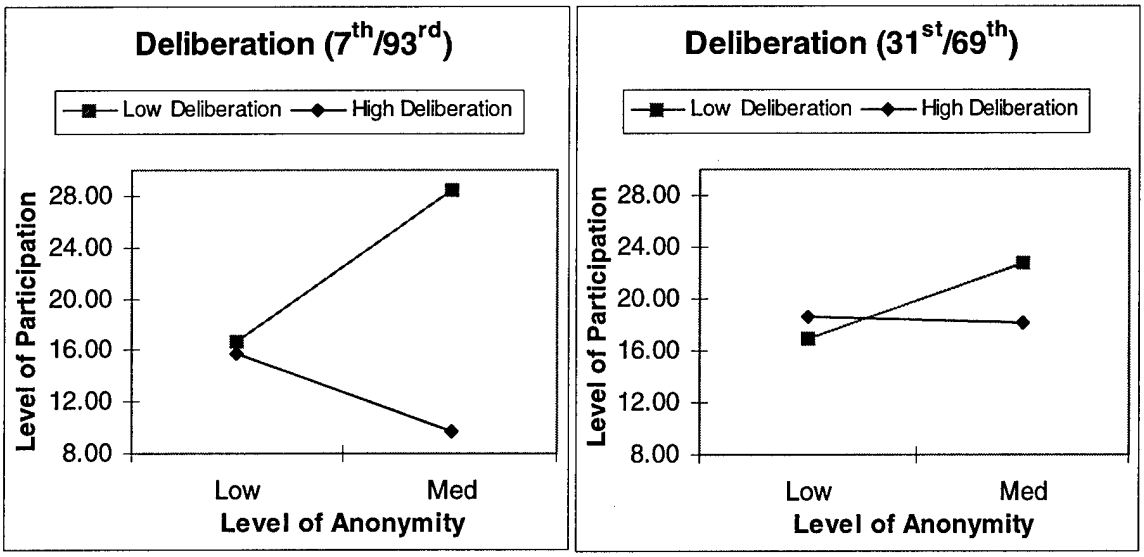


Figure 14: Deliberation moderated by anonymity at both percentiles

4.5 Summary

This chapter presented results from the analysis of data collected from the experiment. Included are the results from *t*-tests to determine if there was a significant difference in participation between various levels of personality characteristics. Also, the results of an ANOVA were presented to determine if anonymity was a significant moderator of personality characteristics and participation. Table 42 below summarizes the research findings by stating if the hypothesis was supported, marginally supported, or not supported. Chapter five will discuss the results of the experiment by looking at each of the research hypothesis. In addition, chapter five will summarize the research findings and include limitations and recommendations for future research.

Table 42: Summary of Research Findings

Agreeableness		**Conscientiousness**	
Hypothesis 1a	S	Hypothesis 2a	NS
Hypothesis 1b	NS	Hypothesis 2b	MS
Hypothesis 1c	S	Hypothesis 2c	NS[1]
Trust		**Competence**	
Hypothesis 3a	NS	Hypothesis 6a	S
Hypothesis 3b	NS	Hypothesis 6b	S
Hypothesis 3c	NS	Hypothesis 6c	NS
Straightforwardness		**Order**	
Hypothesis 4a	NS	Hypothesis 7a	S
Hypothesis 4b	S	Hypothesis 7b	S
Hypothesis 4c	S	Hypothesis 7c	S
Compliance		**Deliberation**	
Hypothesis 5a	S	Hypothesis 8a	S
Hypothesis 5b	S	Hypothesis 8b	S
Hypothesis 5c	S	Hypothesis 8c	NS[2]

S - Supported, NS - Not Supported, MS - Marginally Supported

NS[1] - Anonymity is a significant moderator in opposite direction as hypothesized.

NS[2] - Anonymity is a significant moderator for a low level of deliberation.

V. Conclusions and Recommendations

5.1 Introduction

The results of this study have supported the research model proposed in this study, which suggested that personality and the interaction of personality and anonymity will influence participation in a GSS supported decision-making meeting. This study investigated explanations for the mixed results found in GSS research on the benefits of anonymity. This chapter will present the overall conclusions of this research along with any study limitations and recommendations for future research.

5.2 Hypothesis 1: Effects of Agreeableness

Hypothesis 1 proposed an individuals level of agreeableness will effect their participation for both on-task and affirmation comments and that anonymity would moderate their participation. Hypothesis 1 was separated into three separate sub-hypothesis, which will be discussed in the following three sections.

5.2.1 Hypothesis 1a: Effects of Agreeableness on Participation for On-Task Comments

Hypothesis 1a stated an individual with a low level of agreeableness would provide more on-task comments than an individual with a high level of agreeableness. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis.

The results show a statistically significant difference between low and high levels of agreeableness, with the low level providing more on-task comments than the high level. There was not a significant difference between very low and very high levels of

agreeableness. Although not supported at this level, the very low level did provide more comments than the very high level.

The research literature on agreeableness has shown it is a good predictor of job performance (Barrick and Mount, 1991). The agreeable person works better with others and is more willing to resolve conflicts, but the opposite is true for the disagreeable person. This suggests that a disagreeable person would attempt to dominate the meeting, and would not be able to resolve conflicts to reach a quality decision. Based on this idea, these findings suggest it might be important to know the mix (number of agreeable and disagreeable) of individuals in a group. If there are to many disagreeable individuals they will dominate the group, which will result in poor job performance.

5.2.2 Hypothesis 1b: Effects of Agreeableness on Participation for Affirmation Comments

Hypothesis 1b stated an individual with a high level of agreeableness would provide more affirmation comments than an individual with a low level of agreeableness. A review of the *t*-test results from Chapter IV shows there is no support for this hypothesis.

Although not supported, the very high level of agreeableness did provide more affirmation comments than the very low level. The findings for this hypothesis were not expected. The research literature acknowledges that an individual may be an agreeable individual overall, but may score low on one or more of the facets. This was true for this study. The facets of Straightforwardness and Compliance both provided significantly more affirmation comments, but the facet of Trust offset these since it did not. This will be presented in the facet-level discussion for hypotheses 3-5.

5.2.3 Hypothesis 1c: Effects of Agreeableness on Participation Moderated by Anonymity

Hypothesis 1c stated anonymity moderates the relationship between agreeableness and participation such that an individual with a low level of agreeableness will provide more on-task comments with a high level of anonymity than with a low level of anonymity. A review of the ANOVA results from Chapter IV shows there is strong support for this hypothesis.

The results show there is a statistical difference between the levels of anonymity for a low level of agreeableness at both percentile sets. This hypothesis is further supported since a high level of agreeableness did not result in a significant difference between levels of anonymity. This means the level of anonymity will effect participation for an individual with a low level of agreeableness, but it will not have an effect on an individual with a high level of agreeableness.

Providing anonymous inputs may be detrimental to the success of a meeting if there are disagreeable individuals in the group. Anonymity allows the disagreeable person to participate more in a GSS supported meeting. As stated previously, groups with agreeable individuals will perform better, but anonymity will allow the disagreeable individuals to participate more and therefore create more conflict. This will result in poor performance from the group.

5.3 Hypothesis 2: Effects of Conscientiousness

Hypothesis 2 proposed an individuals level of conscientiousness will effect their participation for both on-task and affirmation comments and that anonymity would

moderate their participation. Hypothesis 2 was separated into three separate sub-hypothesis, which will be discussed in the following three sections.

5.3.1 Hypothesis 2a: Effects of Conscientiousness on Participation for On-Task Comments

Hypothesis 2a stated an individual with a high level of conscientiousness would provide more on-task comments than an individual with a low level of conscientiousness. A review of the *t*-test results from Chapter IV shows there is no support for this hypothesis.

As with the agreeableness domain, the lack of significant findings may be a result of using only three of the six facets used to measure conscientiousness. Conscientious individuals are task-oriented and strive to complete given tasks, but the way they accomplish these tasks can affect their participation in a brainstorming task such as the Moon Scenario. Two the facets, order and deliberation, used to generate a conscientiousness score are related to how an individual goes about accomplishing a task. An orderly and deliberate person will take their time to ensure they get the task done in an organized and methodical manner. Such an individual would therefore have a lower level of participation in comparison to others. This was suggested by the results of these two facets since the high scorer for both provided significantly less on-task comments than a low scorer.

5.3.2 Hypothesis 2b: Effects of Conscientiousness on Participation for Affirmation Comments

Hypothesis 2b stated an individual with a high level of conscientiousness would provide more affirmation comments than an individual with a low level of conscientiousness. A review of the *t*-test results from Chapter IV shows there is marginal support for this hypothesis.

The results show there is a marginal difference between the very low and very high levels of conscientiousness. Although not statistically supported, the high level of conscientiousness did provide more affirmation comments than the low level. As with the on-task comments for conscientiousness, the facets of order and deliberation had an effect on the results for affirmation comments.

5.3.3 Hypothesis 2c: Effects of Conscientiousness on Participation Moderated by Anonymity

Hypothesis 2c stated anonymity moderates the relationship between conscientiousness and participation such that an individual with a low level of conscientiousness will provide more on-task comments with a low level of anonymity than with a high level of anonymity. A review of the ANOVA results from Chapter IV shows there is no support for this hypothesis as stated. Instead of more comments at the low level of anonymity there were more at the higher level of anonymity.

The results show there is a statistical difference between the levels of anonymity for a low level of conscientiousness at both percentile sets. The direction of the anonymity effect was reversed from that hypothesized. There were significantly more

comments made in the higher level of anonymity than at the lower level of anonymity. This evidence is further supported since a high level of conscientiousness did not result in a significant difference between levels of anonymity. This means the level of anonymity will effect participation for an individual with a low level of conscientiousness, but it will not have an effect on an individual with a high level of conscientiousness.

The results for conscientiousness were affected by the results of the deliberation facet. The moderating effects that resulted for deliberation were not supported by the research literature, and therefore were not hypothesized to have the effect they did. Since conscientiousness is determined by combining the facets, these results affected the results for conscientiousness.

The difficulty of the task may have affected the results. Conscientious individuals are task-oriented and strive for excellence. These qualities may not have been drawn out due to the task. The task was simple and did not require the participants to expend a great deal of energy. A more difficult task may have altered individual's perceptions of the amount of effort required to complete the task.

5.4 Hypothesis 3: Effects of Trust

Hypothesis 3 proposed an individuals level of trust will effect their participation for both on-task and affirmation comments and that anonymity would moderate their participation. Hypothesis 3 was separated into three separate sub-hypothesis, which will be discussed in the following three sections.

5.4.1 Hypothesis 3a: Effects of Trust on Participation for On-Task Comments

Hypothesis 3a stated an individual with a high level of trust would provide more on-task comments than an individual with a low level of trust. A review of the *t*-test results from Chapter IV shows there is no support for this hypothesis.

This hypothesis was developed under the pretense that a trusting individual would be able to resolve conflicts in a group setting since they trusted others intentions were honest. The task given to participants for this study was not controversial and did not create much conflict between group members. Therefore, the participants were not put in a situation where they had to rely on their trust of others. The number of comments provided by both low and high scorers on this scale were almost identical, which may have resulted from the lack of conflict within the group.

5.4.2 Hypothesis 3b: Effects of Trust on Participation for Affirmation Comments

Hypothesis 3b stated an individual with a high level of trust would provide more affirmation comments than an individual with a low level of trust. A review of the *t*-test results from Chapter IV shows there is no support for this hypothesis.

As with the results for on-task comments, the lack of statistical significance for affirmation comments may be a result of the task not being controversial. Although not significant, an individual with a high level of trust did provide more affirmation comments than an individual with a low level of trust. The effects of trust may have caused the high individual to provide more comments. The trusting individual believes others have good intentions. They would acknowledge the comments of others as being a well-intentioned effort to complete the task.

5.4.3 Hypothesis 3c: Effects of Trust on Participation Moderated by Anonymity

Hypothesis 3c stated anonymity moderates the relationship between trust and participation such that an individual with a low level of trust will provide more on-task comments with a low level of anonymity than with a high level of anonymity. A review of the ANOVA results from Chapter IV shows there is no support for this hypothesis.

5.5 Hypothesis 4: Effects of Straightforwardness

Hypothesis 4 proposed an individuals level of straightforwardness will effect their participation for both on-task and affirmation comments and that anonymity would moderate their participation. Hypothesis 4 was separated into three separate sub-hypothesis, which will be discussed in the following three sections.

5.5.1 Hypothesis 4a: Effects of Straightforwardness on Participation for On-Task Comments

Hypothesis 4a stated an individual with a high level of straightforwardness would provide more on-task comments than an individual with a low level of straightforwardness. A review of the *t*-test results from Chapter IV shows there is no support for this hypothesis.

Similar to the facet of trust, this hypothesis was developed from research of conflict resolution. Straightforward individuals typically attempt to resolve conflicts when they arise in a group setting, but for an individual that is not straightforward will resist showing their true feelings. The task given to participants for this study was not controversial and did not create much conflict between group members. Therefore, the

participants were not put in a situation where they had to deal with conflict. The number of comments provided by both low and high scorers on this scale were almost identical, which may have resulted from the lack of conflict within the group.

5.5.2 Hypothesis 4b: Effects of Straightforwardness on Participation for Affirmation Comments

Hypothesis 4b stated an individual with a high level of straightforwardness would provide more affirmation comments than an individual with a low level of straightforwardness. A review of the *t*-test results from Chapter IV shows there is strong support for this hypothesis. The results show a statistically significant difference between low and high levels of straightforwardness, with the high level providing more affirmation comments than the low level.

Unlike the on-task comments, the results for affirmation comments are not dependent on resolving conflict. The straightforward person will express their opinions of others comments. The individual that is not straightforward will be guarded and will hold back their opinions of others comments. It is beneficial to have individuals that are willing to express their opinions of others comments. It is through this dialogue that group members know if they are progressing toward a quality decision. Therefore, it would be beneficial to have straightforward individuals within a group.

5.5.3 Hypothesis 4c: Effects of Straightforwardness on Participation Moderated by Anonymity

Hypothesis 4c stated anonymity moderates the relationship between straightforwardness and participation such that an individual with a low level of straightforwardness will provide more on-task comments with a high level of anonymity than with a low level of anonymity. A review of the ANOVA results from Chapter IV shows there is strong support for this hypothesis.

The results show there is a statistical difference between the levels of anonymity for a very low level of straightforwardness. This hypothesis is further supported since all other levels of straightforwardness did not result in a significant difference between levels of anonymity. This means the level of anonymity will effect participation for an individual with a very low level of straightforwardness, but it will not have an effect on an individual with any other level of straightforwardness.

Providing anonymity of inputs would be beneficial for individuals that are not straightforward. These individuals tend to hold back and not express their opinions. As stated previously, it is beneficial to have inputs from all group members. Anonymity does not adversely affect the straightforward person, so it results in a positive effect on participation.

5.6 Hypothesis 5: Effects of Compliance

Hypothesis 5 proposed an individuals level of compliance will effect their participation for both on-task and affirmation comments and that anonymity would

moderate their participation. Hypothesis 5 was separated into three separate sub-hypothesis, which will be discussed in the following three sections.

5.6.1 Hypothesis 5a: Effects of Compliance on Participation for On-Task Comments

Hypothesis 5a stated an individual with a low level of compliance would provide more on-task comments than an individual with a high level of compliance. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis.

The results show there is a statistical difference between the low and high levels of compliance. An individual with a low level of compliance participated more than an individual with a high level of compliance. Although not statistically significant, the same held true at the very low and very high levels of compliance.

It is detrimental to group performance to have non-compliant individuals controlling a meeting. They are more aggressive than compliant individuals and tend to compete rather than cooperate. Compliant individuals tend to defer to others, which along with the aggressive nature of the non-compliant individual, may result in an atmosphere that is not productive. It would be beneficial to have a more compliant individual in charge of the meeting to promote cooperation.

5.6.2 Hypothesis 5b: Effects of Compliance on Participation for Affirmation Comments

Hypothesis 5b stated an individual with a high level of compliance would provide more affirmation comments than an individual with a low level of compliance. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis.

The hypothesis was supported for very a low/very high level of compliance. The results are somewhat confusing since both percentile sets were shown to be significantly different, but they were in opposite directions. At the very low/very high level of compliance there were significantly more affirmation comments at the very high level. At the low/high level of compliance there were significantly more affirmation comments at the low level. This means at the extremes (very low/very high) an individual with a very high level of compliance will provide significantly more affirmation comments, but as the level of compliance moves toward the mean the opposite will be true. The significance of the $31^{st}/69^{th}$ percentile may be a random effect that is not dependent on an individual's level of compliance.

The results at the extremes are important to consider. A very compliant individual will be more cooperative than at any other level. They will agree with others to either avoid confrontations or to resolve them when they do exist. Individuals at the lower levels tend to be more competitive and will insist on getting their point across. They would provide less affirmation comments and more on-task comments since they are trying to make their opinions about the task heard. Individuals at the extreme levels of compliance may not be the best individuals to have in a decision-making meeting. The high scorer will defer to others, while the low scorer will be competitive.

5.6.3 Hypothesis 5c: Effects of Compliance on Participation Moderated by Anonymity

Hypothesis 5c stated anonymity moderates the relationship between compliance and participation such that an individual with a low level of compliance will provide more on-task comments with a high level of anonymity than with a low level of

anonymity. A review of the ANOVA results from Chapter IV shows there is support for this hypothesis.

The results show there is a statistical difference between the levels of anonymity for a low level of compliance at both percentile sets. Also, there was a marginally significant difference between the levels of anonymity for a high level of compliance. This hypothesis is further supported since a very high level of compliance did not result in a significant difference between levels of anonymity. This means the level of anonymity will effect participation for an individual with a low level of compliance, but it will have only a marginal effect on an individual with a high level of compliance.

Anonymity may be detrimental to group performance since it benefits a non-compliant individual. A low scorer will participate more in higher anonymity, but this will not always result in a positive outcome for the group. As stated earlier, low scorers on this characteristic tend to be competitive and aggressive. Anonymity allows them to express their anger and aggression without fear of reprisal for their actions. If they are identified they would be more reluctant to express these emotions.

5.7 Hypothesis 6: Effects of Competence

Hypothesis 6 proposed an individuals level of competence will effect their participation for both on-task and affirmation comments and that anonymity would moderate their participation. Hypothesis 6 was separated into three separate sub-hypothesis, which will be discussed in the following three sections.

5.7.1 Hypothesis 6a: Effects of Competence on Participation for On-Task Comments

Hypothesis 6a stated an individual with a high level of competence would provide more on-task comments than an individual with a low level of competence. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis.

The results show a statistically significant difference between very low and very high levels of competence, with the very high level providing more on-task comments than the low level. Also, a marginally significant difference exists between low and high levels of competence with the high level providing more on-task comments than the low level.

Competent individuals will participate more since they are confident in their abilities. They are not adversely affected by their surroundings since they feel well prepared to deal with anything that may arise. On the other hand, the individual that is not competent feels they are not capable and this may hinder the outcome of the meeting.

5.7.2 Hypothesis 6b: Effects of Competence on Participation for Affirmation Comments

Hypothesis 6b stated an individual with a high level of competence would provide more affirmation comments than an individual with a low level of competence. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis.

The results show there is a statistical difference between the low and high levels of competence. An individual with a high level of competence participated more than an individual with a low level of competence. Although not statistically significant, the same held true at the very low and very high levels of competence.

As with on-task comments, a competent individual will provide more affirmation comments since they are confident. They are not reluctant to agree or disagree with others ideas. The individual that is not competent may be hesitant to question another's thoughts since they would have to explain why they were questioning them. Competent individuals would improve the decision-making group since they are confident in their abilities, which equates to confidence in completing the given task.

5.7.3 Hypothesis 6c: Effects of Competence on Participation Moderated by Anonymity

Hypothesis 6c stated anonymity moderates the relationship between competence and participation such that an individual with a low level of competence will provide more on-task comments with a high level of anonymity than with a low level of anonymity. A review of the ANOVA results from Chapter IV shows there is no support for this hypothesis.

The results show there is a marginal difference between the levels of anonymity for a very high level of competence. Although not statistically significant, there was also a difference between the levels of anonymity for all other levels of competence. This implies regardless of the level of competence anonymity will have some moderating effect on participation.

Accountability is a key component to how a competent individual reacts in a group setting. The hypothesis is based on research that claims a competent individual will participate regardless of the accountability, but an individual that is not competent will hold back if they are not held accountable. There was accountability for the task completed for this study, but there was no real fear of punishment. There was no

incentive for the participants to contribute. It is possible with a greater motivational influence, such as punishment for poor performance, the anonymity would have been more of a factor.

5.8 Hypothesis 7: Effects of Order

Hypothesis 7 proposed an individuals level of order will effect their participation for both on-task, but not for affirmation comments. Also, anonymity would not have a moderating effect on participation. Hypothesis 7 was separated into three separate sub-hypothesis, which will be discussed in the following three sections.

5.8.1 Hypothesis 7a: Effects of Order on Participation for On-Task Comments

Hypothesis 7a stated an individual with a low level of order would provide more on-task comments than an individual with a high level of order. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis.

The results show a statistically significant difference between very low and very high levels of order, with the very low level providing more on-task comments than the very high level. An individual with a very low level of order participated more than an individual with a very high level of order. Also, an individual with a low level of order participated more than an individual with a high level of order, but not at a significant level.

An orderly individual needs more time to organize their thoughts and the thoughts of others. This does not mean they are not productive members of the group. This just means they will take longer to make their comments. It could become a problem if they

become compulsive about their organization. In contrast, the disorderly individual cannot get organized and they have no clear method of completing a task. It would be beneficial to have an individual that is not at either extreme. Group members must have some organizational skills, but not to the point where they become obsessive.

5.8.2 Hypothesis 7b: Effects of Order on Participation for Affirmation Comments

Hypothesis 7b stated order would have no effect on the amount of affirmation comments. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis. Neither of the two percentile levels was found to be significantly different. Regardless of the level of order, approximately the same number of affirmation comments was made. Order does not affect affirmation comments since it does not take organizational skills to respond to another's comments.

5.8.3 Hypothesis 7c: Effects of Order on Participation Moderated by Anonymity

Hypothesis 7c stated anonymity would have no moderating effect on order. A review of the ANOVA results from Chapter IV shows there is strong support for this hypothesis. There was not a significant difference between anonymity levels for any level of order.

Anonymity does not effect participation regardless of an individual's level of order. This characteristic deals only with organizational skills, so anonymity will not change how orderly someone.

5.9 Hypothesis 8: Effects of Deliberation

Hypothesis 8 proposed an individuals level of order will effect their participation for both on-task, but not for affirmation comments. Also, anonymity would not have a moderating effect on participation. Hypothesis 8 was separated into three separate sub-hypothesis, which will be discussed in the following three sections.

5.9.1 Hypothesis 8a: Effects of Deliberation on Participation for On-Task Comments

Hypothesis 8a stated an individual with a low level of deliberation would provide more on-task comments than an individual with a high low level of deliberation. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis.

The results show a statistically significant difference between very low and very high levels of deliberation, with the very low level providing more on-task comments than the very high level of deliberation. Although not statistically significant, the same held true at the low and high levels of deliberation. An individual with a low level of deliberation will participate more than an individual with a high level of deliberation.

The results for deliberation are similar to those of order. A deliberate individual thinks carefully before they act. As with order, this may take longer, which will result in the deliberate individual being slower to make comments. This can be beneficial since they make a well thought out comment. The individual that is not deliberate will speak out without considering what they are saying. The extremes can be detrimental since they are either taking to long to make a comment or they are making comments that are not beneficial to the meeting. The meeting would be improved with an individual that is not at either extreme.

5.9.2 Hypothesis 8b: Effects of Deliberation on Participation for Affirmation Comments

Hypothesis 8b stated deliberation would have no effect on the amount of affirmation comments. A review of the *t*-test results from Chapter IV shows there is support for this hypothesis. Neither of the two percentile levels was found to be significantly different. Regardless of the level of deliberation, approximately the same number of affirmation comments was made. Deliberation does not have an affect on affirmation comments since it does not require a great deal of thought to respond to others.

5.9.3 Hypothesis 8c: Effects of Deliberation on Participation Moderated by Anonymity

Hypothesis 8c stated anonymity would have no moderating effect on deliberation. A review of the ANOVA results from Chapter IV shows there is no support for this hypothesis. Instead, there is strong support for the notion that anonymity moderates the relationship between deliberation and participation such that an individual with a low level of deliberation will provide more on-task comments with a high level of anonymity than with a low level of anonymity.

The results show a statistically significant difference between the levels of anonymity for a low level of deliberation at both percentile levels. There were more comments made at the higher level of anonymity than the lower level of anonymity.

The anonymity effects may be a result of the low scorer being more willing to speak out since their comments are anonymous. They cannot be identified so they take an even shorter amount of time to speak out.

5.10 Conclusions and Recommendations

The conclusions of this study support the premise that personality and its interaction with anonymity can have important effects on a GSS supported decision-making meeting. The hypotheses presented can be separated into three categories: personality effects for on-task comments, personality effects for affirmation comments, and the interactive effects of personality and anonymity for on-task comments. Also, the effects stated above should be done at both the domain level and at the facet level.

The facet level analysis proved to be the most beneficial as suggested by Paunonen (1998) and Costa and McCrae (1992). The significance of individual traits may be lost when combining facet data together to make a single domain level score. For example, an individual may have a high level of order, but a low level of competence. Valuable information is lost when these two facets are combined to create a domain score. Analysis at the facet level would provide a more refined level of analysis.

Personality has a significant impact on participation within a GSS supported meeting. An individual's personality plays a major role in how they interact within a group. Extreme levels of a personality trait are more likely to affect participation. Understanding an individuals personality will help meeting organizers to predict how likely it is for the individual to contribute to the success of the meeting. For the characteristics used in this study, the low scorer for agreeableness, compliance, order and deliberation provided more on-task comments. These individuals will dominate the meeting and have their opinions heard. In most cases it would be beneficial to have the average or high scorers participating more. For example, it would be better to have a compliant individual controlling the meeting as opposed to a non-compliant individual.

The non-compliant individual is concerned primarily with having their solution heard, which is not necessarily the best solution to the problem.

In sum, this research suggests that the conflicting findings in GSS research on anonymity may be a result of the combination of individuals that were used for those studies. This study has shown personality itself can impact participation. Depending on the personality mix of individuals in a group, the difference in participation may vary when compared to other groups with a different mix. Personality was also shown to interact with anonymity to improve participation for some, but not all. Consistent with most prior GSS studies, the results suggest anonymity does have a positive effect; however, this effect was significant only for certain personality traits. Also, there were no instances of anonymity causing a significant decrease in participation. This may account for the findings of other researchers that in general anonymity improves participation.

The level of anonymity was also found to be important. Individuals do not benefit from a purely anonymous setting. In fact, it actually hinders participation. This may be caused by the inability of individuals to integrate comments into the flow of a conversation. They spend more time trying to determine who made a comment instead of focusing on the comment and its merits. The results of this study suggest comment labels of some type are beneficial to improving the GSS meeting.

Individual personality attributes could be integrated into future GSS use. The findings of this study suggest some personality characteristics are predictors of participation. Facilitators can configure a GSS session considering the characteristics of the meeting participants. For example, since anonymity benefits individuals with a low

level of conscientiousness it would be beneficial to use anonymous inputs for a group made up primarily of these individuals. The quality of the decision resulting from a decision-making meeting could be improved by manipulating the level of anonymity.

5.11 Limitations and Recommendations for Future Research

A limitation of this study was the lack of difficulty of the task given to participants. The task was simple and did not result in much conflict between group members. A number of the hypotheses were founded on how individuals cope with conflict. Without the conflict, the specific personality characteristics of concern were not drawn out. Future research should attempt to use a more controversial task. One that would result in more conflict causing participants to take one side and argue its merits.

A second limitation of this study was the inability to instill a sense of accountability for an individual's actions. As with the simplicity of the task, a number of the hypotheses were based on individuals being accountable for their actions. The participants were not motivated to complete the task out of fear of reprisal. The only accountability individuals had came from fellow group members. A real world problem would have accountability, which may invoke different reactions from different personality characteristics. Future research should try to motivate individuals to complete the task. The motivation should be based on some form of incentive or punishment based on the quality of the decision the group makes.

A third limitation was the inability to analyze a wider range of personality characteristics. The length of time needed to conduct one experimental session limited the number of personality characteristics that could be studied. If more time was

available a wider range of characteristics could have been studied. The findings could have been stronger if more characteristics were analyzed. The conclusion that anonymity benefited some individuals but had not effect on others would have stronger support if it were found across a wider range of characteristics. The domain analysis was also hindered since only three of the six facets used to determine a domain score were used. Future research should allow more time or find an alternate method of determining personality characteristics. This would make it possible to test for more characteristics.

One of the most notable findings of this study is the effect of anonymity on specific personality characteristics. This finding should be further studied to support this finding. Since there have been contradictory findings, it would be beneficial to conduct further experiments to determine which characteristics are effected by anonymity. This study used just a small sample of characteristics possible. It may be that there are some characteristics that when introduced to anonymity will inhibit participation. This could further explain why some groups benefit from anonymity and others do not.

5.12 Summary

Meetings are an important part of today's business world. A GSS has been promoted as a means of improving the quantity and quality of ideas within a decision-making meeting. Research into GSS has focused on the benefits of providing anonymity to improve participation, but the findings to date have been inconclusive. The findings of this study suggest personality characteristics should be considered when determining individual participation in a GSS supported meeting. Further, the results suggest personality and its interaction with anonymity has a positive effect on participation for

some individuals, but not all. Therefore, an individual's personality determines whether they benefit from anonymity or are not affected by it.

Appendix A: Moon Scenario

You are a member of a space crew originally scheduled to rendezvous with a mother ship on the lighted surface of the moon. Due to mechanical difficulties, however, your ship was forced to land at a spot some 200 miles from the rendezvous point. During re-entry and landing, much of the equipment aboard was damaged and, since survival depends on reaching the mother ship, the most critical items available must be chosen for the 200-mile trip.

The 15 items left intact and undamaged after landing are listed below. Your task is to rank them in terms of their necessity to your crew in reaching the rendezvous point. Place the number 1 by the most crucial item, the number 2 by the second most crucial, and so on through number 15, the least important.

____ Box of matches
____ First-aid kit containing injection needles
____ Five gallons water
____ Food concentrate
____ Life raft
____ Magnetic compass
____ One case dehydrated milk
____ Parachute silk
____ Portable heating unit
____ Signal flares
____ Solar-powered FM receiver transmitter
____ Stellar map (of the moon's constellation)
____ Two .45-caliber pistols
____ Two 100-pound tanks of oxygen
____ 50 ft. of nylon rope

Appendix B: Desert Scenario

It is approximately 10:00 AM in mid August and you have just crash-landed in the Sonora Desert in southwestern United States. The twin-engine plane, containing the bodies of the pilot and the co-pilot, has completely burned. Only the airframe remains. None of the rest of you has been injured. The pilot was unable to notify anyone of your position before the crash. However, he had indicated before impact that you were 70 miles south - southwest from a mining camp which is the nearest known habitation and that you were approximately 65 miles off the course that was filed in your Flight Plan.

Before the plane caught fire your Patrol was able to salvage the 15 items listed on the attached sheet. Your task is to rank these items according to their importance to your survival. Place the number 1 by the most crucial item, the number 2 by the second most crucial, and so on through number 15, the least important.

____ A pair of sunglasses per person
____ Book entitled "Edible Animals of the Desert"
____ Bottle of salt tablets (1000 tablets)
____ Compress kit and gauze
____ Cosmetic Mirror
____ Flashlight
____ Magnetic compass
____ One liter of water per person
____ One top coat per person
____ Parachute (red and white)
____ Penknife
____ Plastic Raincoat (large size)
____ Sectional Air Map of the Area
____ 2 liters of 100% proof vodka
____ .45 caliber pistol

Appendix C: Post-Test Questionnaire

Answer the questions using the following scale

1 Strongly Disagree
2 Disagree
3 Disagree Somewhat
4 Neither Agree Nor Disagree
5 Agree Somewhat
6 Agree
7 Strongly Agree

_____ I would not mind working with this group again.

_____ I am pleased with the performance of our group.

_____ In my opinion, we worked effectively as a group.

_____ I found the other group members easy to work with.

_____ I enjoyed participating in the group activity.

_____ Learning to use the tools and process provided was easy for me.

_____ I found it easy to use the tools and process to share information.

_____ I found it easy to use the tools and process to receive information.

_____ I found it easy to use the tools and process to make sense of shared information.

_____ I found it easy to use the tools and process to help my group complete the task.

_____ The tools and processes helped us exchange information.

_____ The tools and processes helped us make good use of the information we shared.

_____ The tools and processes helped us to know about the things we agreed on.

_____ The tools and processes helped us to focus on the points where we disagreed.

_____ The tools and processes helped us to know the extent we achieved consensus.

Answer the questions using the following scale

1 Strongly Disagree
2 Disagree
3 Disagree Somewhat
4 Neither Agree Nor Disagree
5 Agree Somewhat
6 Agree
7 Strongly Agree

_____ I experienced few problems expressing my ideas to the other group members.

_____ I felt comfortable putting forward my own ideas.

_____ I had little trouble understanding the points made by other group members.

_____ I was able to comment on the ideas submitted by other group members during the session.

_____ I think the other group members received the information I shared.

_____ One or more of the group members tried to intimidate the others.

_____ One or more of the group members tried to force their opinions on the group.

_____ I felt inhibited from participating in the discussion because of the behavior of one or more of the other members.

_____ I felt pressure to conform to a particular viewpoint.

_____ One or more of the group members tried to dominate the discussion.

_____ Everyone in the group was very involved in the group's discussion.

_____ I got a lot of good ideas about ranking from the other members of my group.

_____ Everyone in my group seemed to contribute all of the ideas they had about the task.

_____ No one seemed to be holding back information.

Answer the questions using the following scale

1 Strongly Disagree
2 Disagree
3 Disagree Somewhat
4 Neither Agree Nor Disagree
5 Agree Somewhat
6 Agree
7 Strongly Agree

_____ My group shared a lot of information while we completed this task.

_____ My group received information on how well we shared information during the first task.

_____ Each member of my group knew how much they had contributed to the group during the first task.

_____ I knew how much information other members of my group shared during the first task.

_____ I could recognize the originator of most comments.

_____ Other group members could connect me to the comments I made.

_____ Other group members knew when I made a contribution to the group.

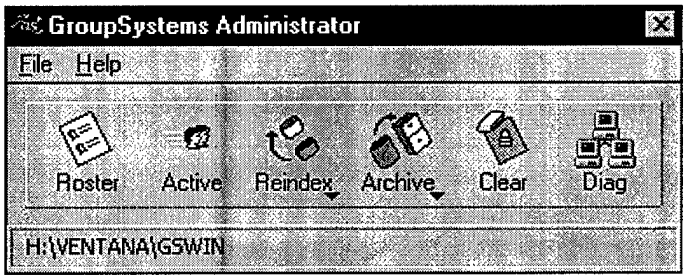
_____ I could tell if someone was sharing more information than other members of the group.

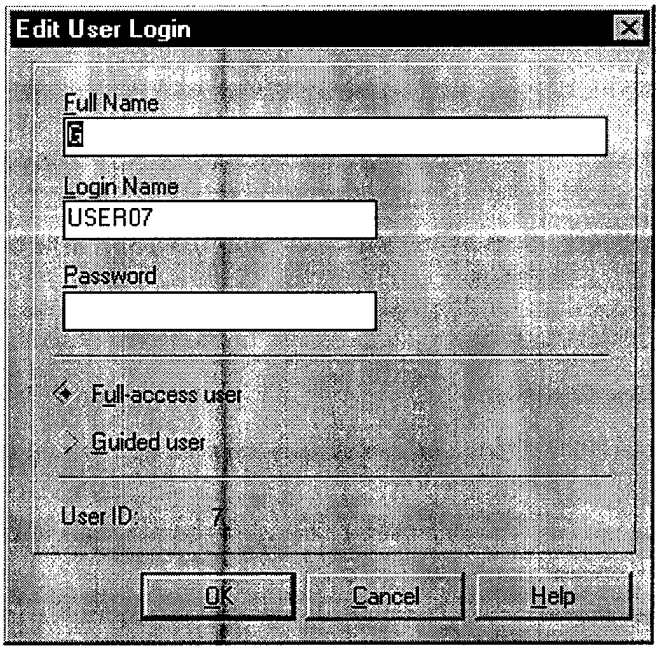
_____ I could tell if someone participated less than other members of the group.

_____ Other group members could judge the extent that I participated in the group.

GSS: Pre-Experiment Steps

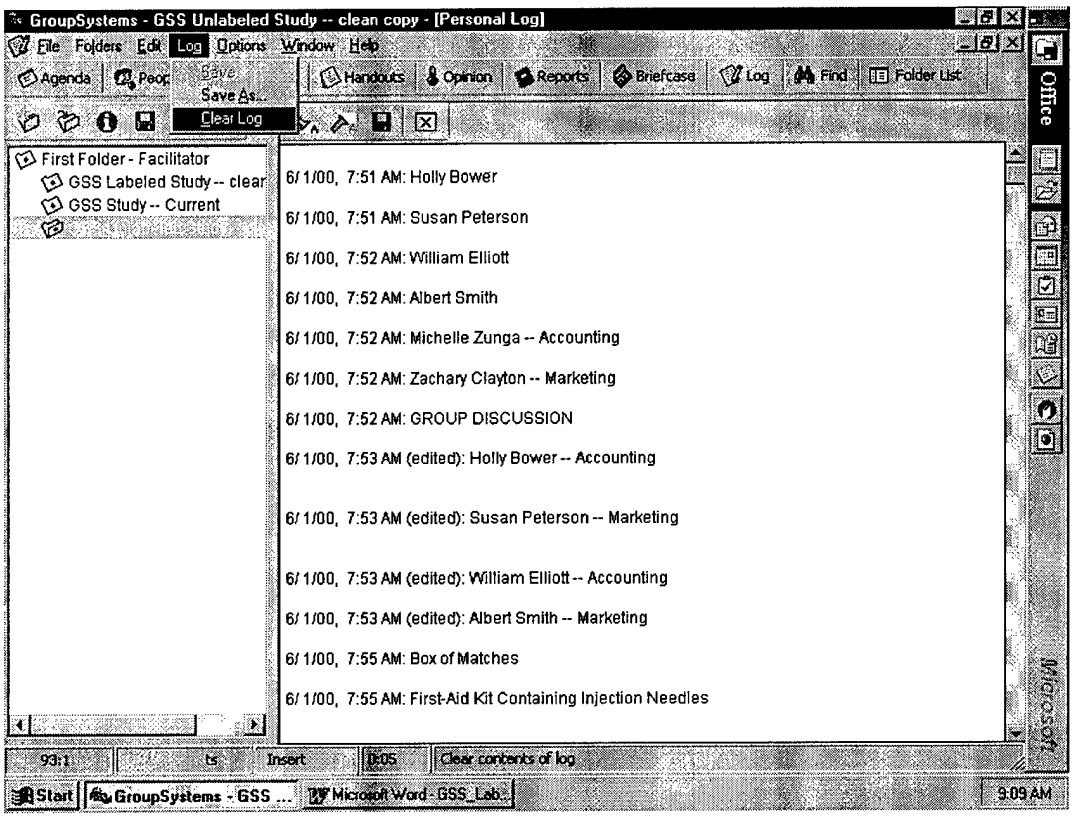
1. Ensure following items are available:
   - Big folder labeled consent forms
   - 4 Manila folders
     - Attached via paper clip are
       - Consent form
       - Demographic/Personality Questionnaire
       - 1 copy of Moon Scenario
2. 2. Check out Projector and printer with paper
3. In Group System Admin, click on Clear, then open roster, edit user terminal, set to full-access user



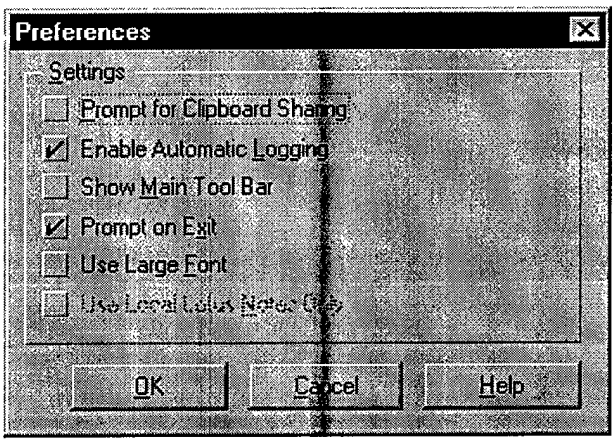


4. Start Group Systems WGE at Facilitator station and all user stations

5. Ensure logs are clear on each subject's machine.



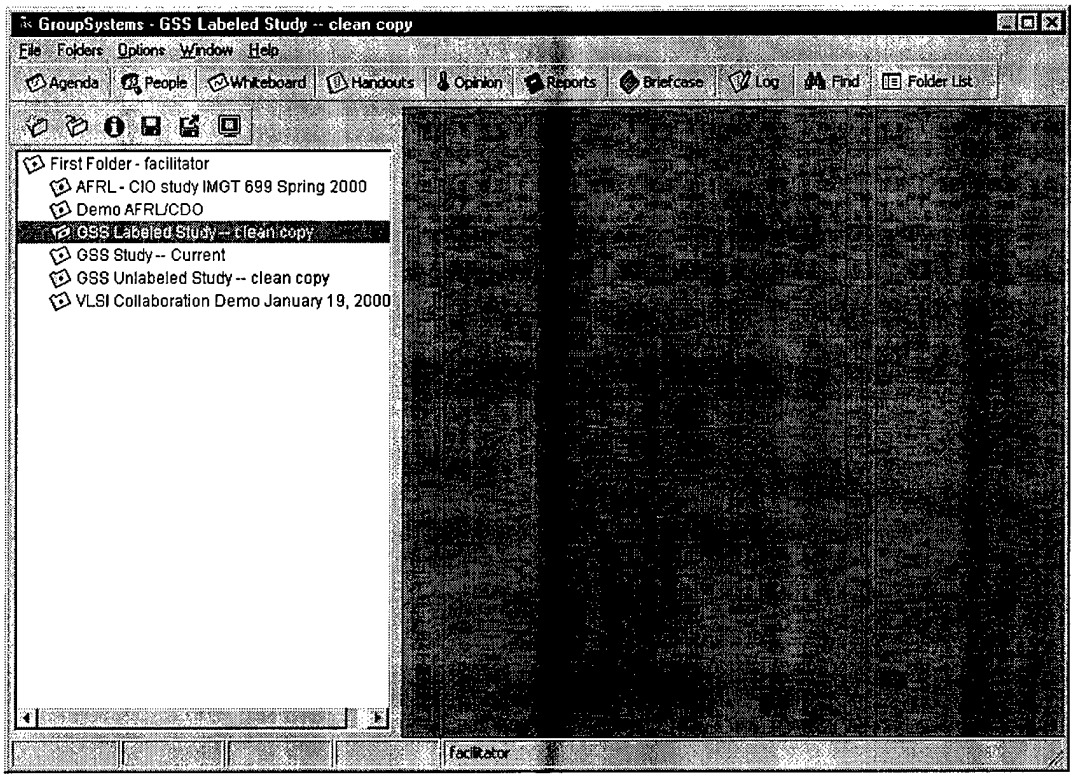
6. At each user station Under Options – Preferences check the following boxes



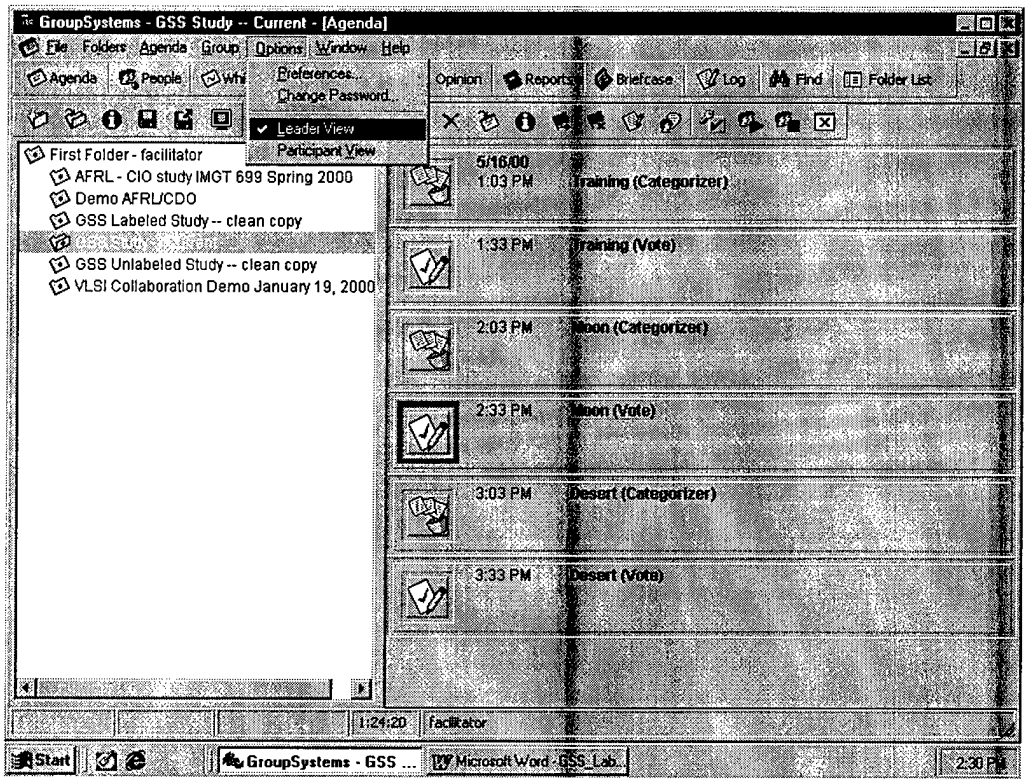
7. Ensure each participant station has a 3.5" floppy inserted in the drive

8. Copy all activities for session from:
   For a labeled session: GSS Labeled Study – clean copy
   For an unlabeled session: GSS Unlabeled Study – clean copy

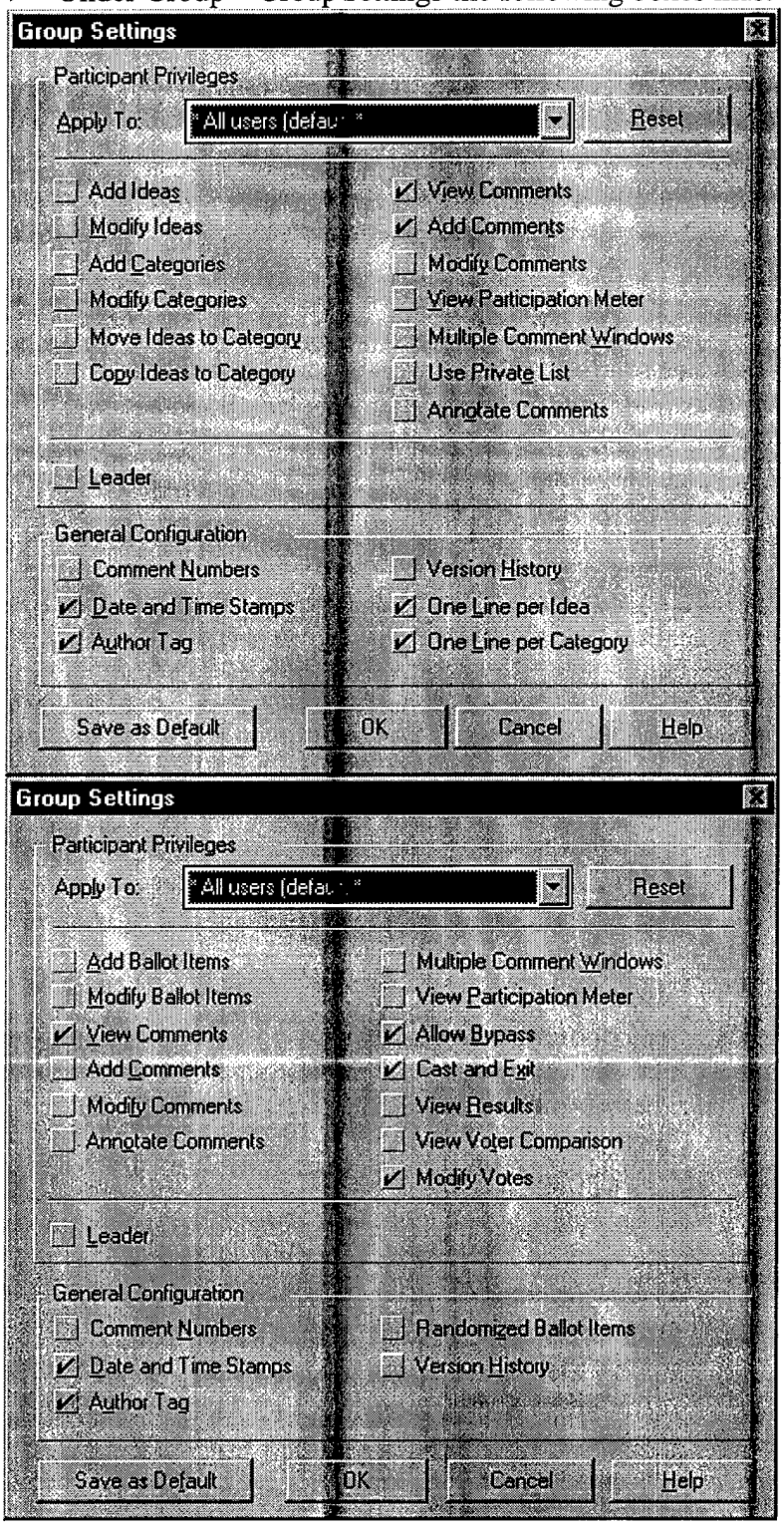
9. Paste to GSS Study – Current



10. Configure each GSS station for EACH ACTIVITY on facilitator station
    - Under Options - Leader View must be selected



- Under Group – Group Settings the following boxes must be checked



11. Researchers Label Subjects Monitors with placard (if applicable)
    - Ensure four placards (blue, green, red and yellow) are available

Prep Room: Introduction

1. When subjects arrive, introduce yourself. Have subjects wait in the prep room. Tell subjects "The task will begin when all participants have arrived."

2. Once all participants have arrived, have all subjects sit down in the prep room.

3. Facilitator says: "Welcome to the study. I'm XX and this is XX. We are AFIT students conducting an experiment for our Masters degree. We will be asking you some questions about yourself. Our study looks at how different types of groups interact to solve a problem. During the course of this experiment you will be asked to complete three questionnaires, receive some group interaction training, and conduct tasks individually and as a group. About half way through this two hour experiment you will be given a short break."

4. Facilitator says: "My assistant will now hand out a manila folder with some attached information. Please don't look at the attached information until asked."

5. Assistant provides participants with manila folder.

6. Facilitator says: "To begin, please remove the consent-form from the manila folder. This form indicates your rights as a participant in the study. Please read the consent form and print and sign your name at the bottom of the page. Your participation is voluntary. If at any time you want to stop please let the facilitator know."

7. Subjects read and sign (if applicable) Consent Form

8. Assistant collects consent forms

9. Facilitator says, "This is the only place your name will be recorded during this experiment."

10. Assistant puts consent forms in big folder labeled consent forms.

11. Facilitator says: "We would now like you to fill out the individual characteristics questionnaire attached to the manila folder. All responses to this questionnaire are completely confidential and will not be associated with you as an individual. Use the rating scale provided to indicate how accurately each statement describes you. Think about yourself as you generally are now and not as you wish to be in the future. Please read each statement carefully. Does anyone have any questions?"

12. Subjects complete questionnaire.

13. Facilitator says: "Please place the questionnaire in the manila folder."

14. Facilitator says: "Now lets complete a problem solving task individually. Please read the scenario and complete the exercise. It will take you approximately 5 minutes to complete the exercise. If you finish early, please remain quiet until everyone completes the exercise. Please remove the scenario from your manila folder."

15. Facilitator says: "Please begin."

16. Subjects individually complete Moon Scenario

17. Facilitator says: "Please place the Moon Scenario in the manila folder."

18. Facilitator says: "Before we move to another room let's discuss group decision making and problem solving in general. The first step is for the group to discuss the problem and all pertinent issues related to the problem. One method often used to do this is "brainstorming" during which ideas are freely generated and not judged on quality or feasibility. Once the brainstorming session is complete, the group then attempts to reach consensus on a solution. This does not necessarily mean all individuals completely agree with the groups' decision, but the decision is one that all can endorse. There are different methods groups use to reach consensus, one of which is voting. If the results of the group vote indicate agreement, then consensus is reached. If the group does not have agreement, further discussion may be required to reach consensus. Remember the purpose of this study is to look at how different types of groups interact to solve a problem. Does anyone have any questions before we move to the next phase of the study."

19. Facilitator says: "Please pick up your manila folder and follow me."

20. Assistant moves subjects to Task Room (GSS Room)

GSS Room: Training

1. Assistant says: "Please take a seat at one of the computers."

2. Subjects sit at one of the GSS stations

3. Training Script

   - Facilitator flips UP projector

   - As you introduce options in GSS point to them on the screen.

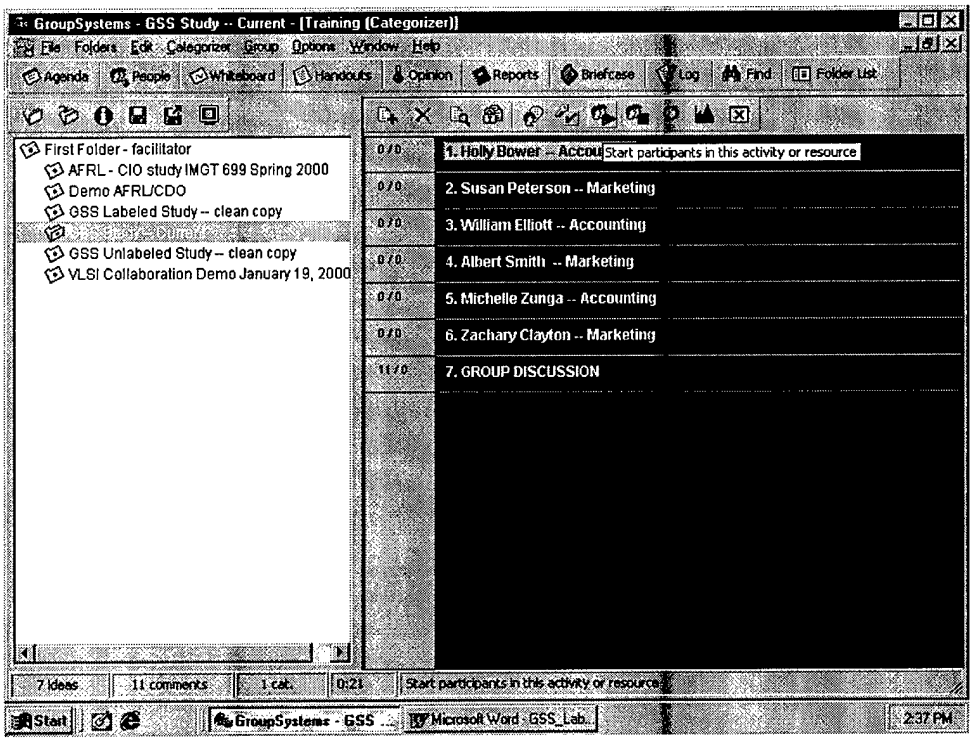
   - Facilitator says: "A group support system is made up of software, computers and a facilitator. Each of your computers has Group System software (point to screen) loaded on it. This software and hardware is often used in the Air Force to increase the effectiveness of decision-making groups."

   - Facilitator says: "We will only be introducing you to a small set of the capabilities of a GSS because of our limited time. As you use this software, please only use the capabilities we introduce to you so we can minimize the impact on your time and ours. For the purposes of this study we will be using two GSS tools: Categorizer and Vote."

   - PAUSE

   - Facilitator says: "Before we begin the actual group problem-solving scenario, we will first guide you through a brief training session. You will be introduced and allowed to practice with GSS Categorizer and Vote tools. Let's begin."

- Facilitator starts participants in Training (Categorizer)



- Facilitator says: "At this point, you should have been invited to join an activity. Please click on Yes." (Note to Researcher: In some cases this field will be blank.)

- Facilitator says: "You may receive another log-in prompt. Please click on OK."

- Facilitator says: "You should now see a list of six names and a category called "Group Discussion". Double Click on Group Discussion."

- Facilitator says: "A new window should appear on your screen. This is a discussion area where you will provide comments for the group problem-solving task. At this point your cursor should be in the large field at the bottom of the window. This is the box where you enter your comments. Please type in one method you would use to rank order the list of names."

- PAUSE

- Facilitator says: "Click on the Submit key at the bottom of the window on the left. The comment you entered should appear in the notepad above the large field. Everyone in the GSS session will be able to see all comments submitted. Does anyone not see other's comments?"

- For a Labeled Session the facilitator says: "If you look at the end of each comment you will see that the GSS software labels the person who entered the comment. You should see our choice of labels (blue, green, red or yellow) at the end of each comment."

- Facilitator says: "As your group brainstorms and you enter your individual comments, all of you will be able to see the inputs of the entire group. Reading others' thoughts and ideas allows you to "piggyback" off each other which should improve your group brainstorming process."

- Facilitator says: "Now that we've shown you how to enter comments, we will now have you perform a practice session before we move into the problem-solving task. Your group's task is to discuss possible ways your group could rank order the names. Any and all comments are valuable, including ideas on how to rank the names, and your thoughts/opinions of each other's ideas. You will have a couple of minutes to discuss the task as a group. At the end of the session we will measure group consensus on how you ranked the list by introducing you to the GSS Vote tool."

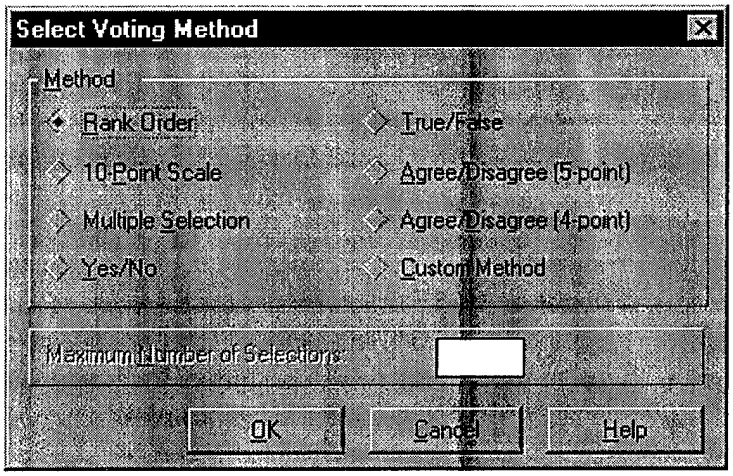
- Facilitator says: "Please begin discussing the task."

- Assistant notifies facilitator when time reaches 5 minutes.

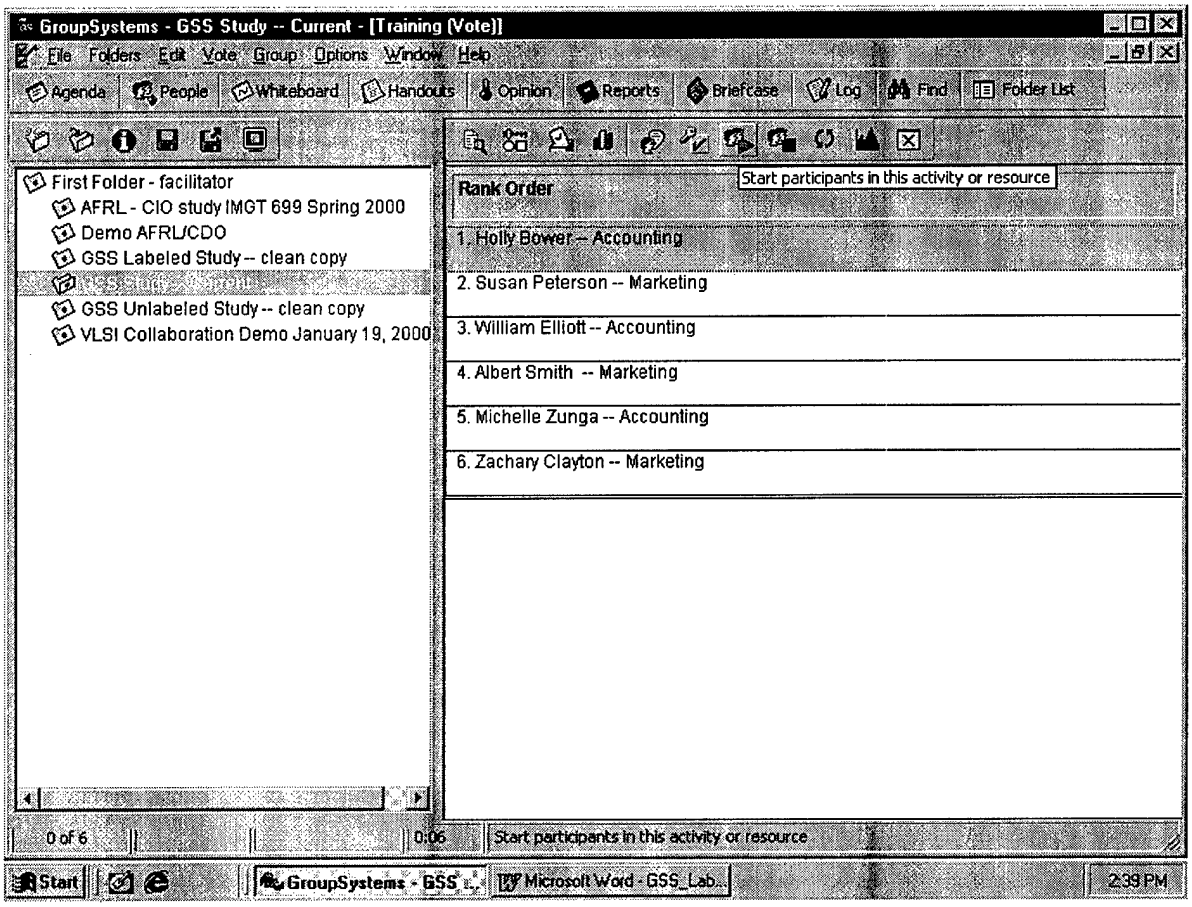
- Facilitator says: "Please stop discussing the task at this time."

- Facilitator says: "You've had plenty of time to discuss possible ways to rank order the list of names. Now it's time to actually rank the names. Hopefully, during the discussion period, your group decided how to rank the list. We will now introduce you to the GSS Vote tool where each of you will individually rank the list of names. Please close the Group Discussion window."

- Facilitator closes training categorizer and selects voting method for ballot and clicks OK.



- Facilitator: Start participants in Training (Vote).

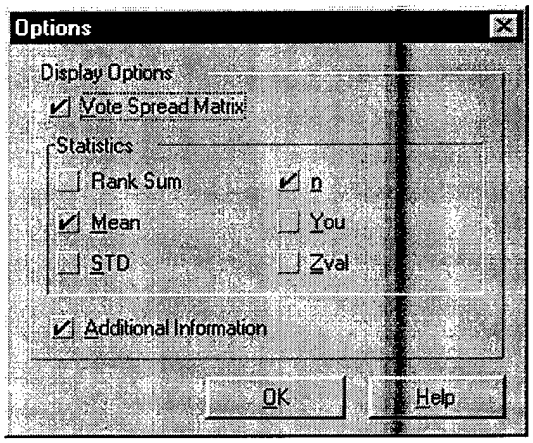


- Facilitator says: "You have been invited to join the Voting activity. Please click yes. Now you should see the original list of names. You change the sequence of the list by clicking and dragging an item to the position in the list you wish to move it. Please begin voting by re-ordering the list now."

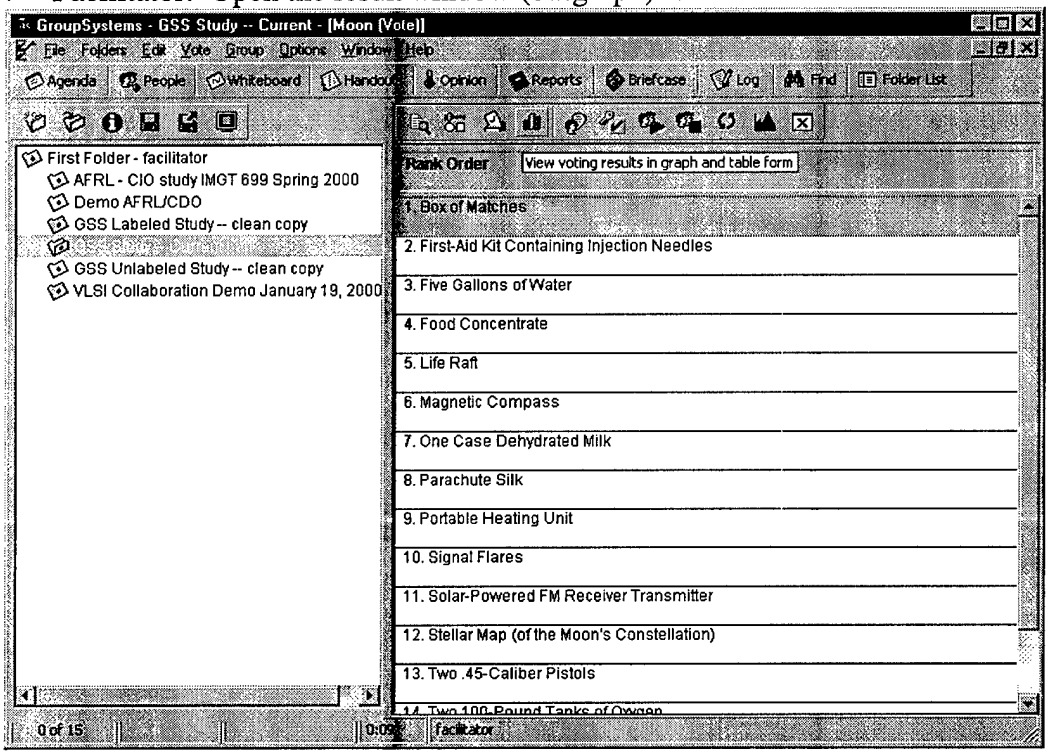
- PAUSE

- Facilitator says: "Once you are satisfied with your list order, cast your ballot by clicking on the "cast ballot" icon, which is the 2nd from the left. You will receive a dialogue box asking you to confirm your ballot. Please click yes and wait for further instructions.

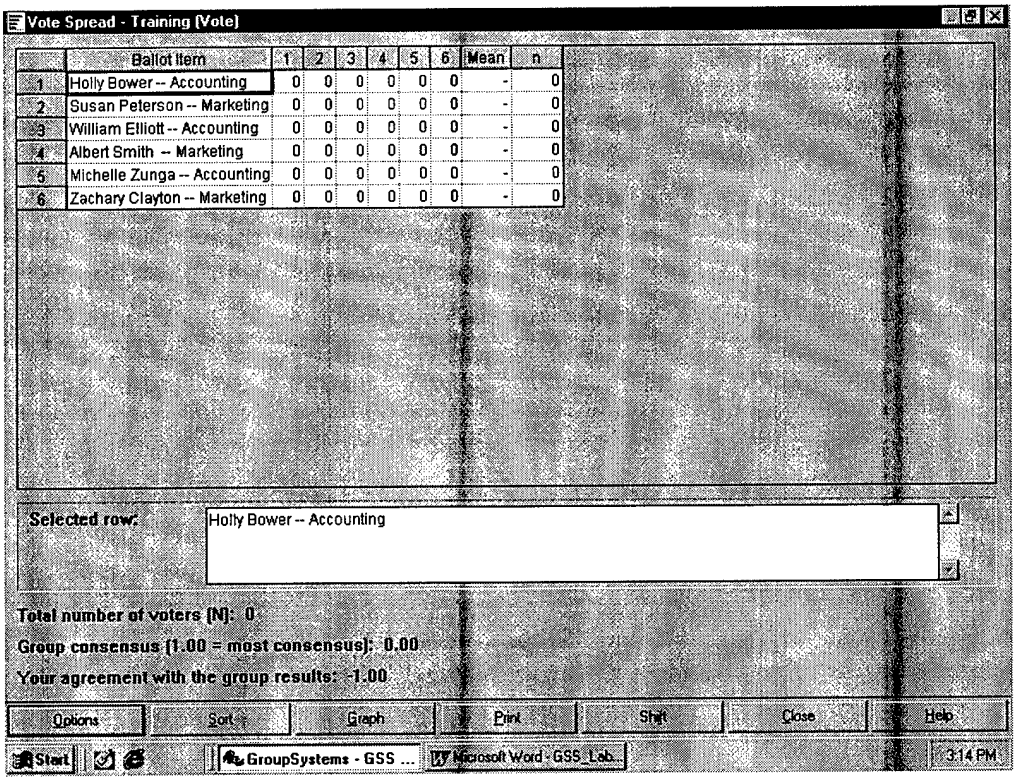
➢ Ensure voting graph tool is set as follows:



➢ Facilitator: Open the result window (bargraph) to monitor individual votes.



➢ When n=number of participants, the group is done. Display the results with the projector and explain the level of group consensus.



- Facilitator says: "During the actual problem-solving tasks following this training, your group will be given 5 minutes after the initial vote to allow your group to determine if everyone is satisfied with the final solution, or if further discussion is needed."

4. Training exercise complete.

5. Facilitator says: "I will now be closing the training session and beginning the first exercise. Please do not enter any information until instructed."

6. Facilitator stops participants in Training (Categorizer).

7. Facilitator stops participants in Training (Vote).

8. Facilitator flips DOWN projector

GSS Room: Experiment One

1. Moon Scenario Script

➢ Facilitator says: "You will have 15 minutes to discuss the scenario as a group. The scenario you will be discussing is the same one you did previously as individuals. At the end of the 15 minutes you will each rank order the list individually. The ranking results will be consolidated as a group to indicate how well the group reached consensus. At this time the group will have another 5 minutes to determine if you have reached consensus. If the group did not reach consensus you should try to resolve any differences. The group will then individually rank the items again."

➢ Facilitator says: "During the 15-minute discussion period, focus on discussing each item's merits, not on where each item should be ranked. You will be able to rank order the list at the end of the 15 minutes. It is important to focus on discussion not on how to rank order since this could shut down conversation. It is normal to experience a lull during conversation, but this is part of group dynamics."

➢ Facilitator says: "Researchers will not answer questions dealing with the scenario during this session, but will assist with GSS questions. We will let you know when there are 5 and 2 minutes left in the session."

➢ Facilitators start participants in Moon Scenario -- Categorizer.

➢ Facilitator says: "At this point, you should have been invited to join an activity. Please click on Yes." (Note to Researcher: In some cases this field will be blank.)

➢ Facilitator says: "Now you should be prompted to enter an author tag. Please click on OK."

➢ Facilitator says: "You have a list of 15 items and a category called "Group Discussion". Double Click on Group Discussion."

➢ Facilitator says: "Are there any questions?"

➢ Facilitator says: "You may begin group discussion on the Moon Scenario."

Time (min/sec)	Facilitator Entry
10:00	FACILITATOR INPUT: YOU HAVE 5 MINUTES LEFT TO DISCUSS THE SCENARIO IF NEEDED.
13:00	FACILITATOR INPUT: YOU HAVE 2 MINUTES LEFT TO DISCUSS THE SCENARIO IF NEEDED.

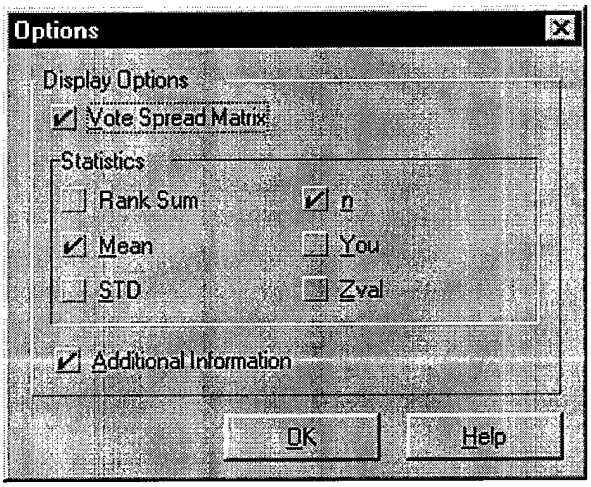
- Subjects finish initial discussion.
- Facilitator says: "Please close your Group Discussion Window."
- Facilitator says: "We will now open a voting tool for your use."
- Facilitator starts Moon (Vote).

- Facilitator says: "You have been invited to join the Voting activity. Please click yes. Now you should see the original list of items. Please begin voting by re-ordering the list now just as you did in the training session."

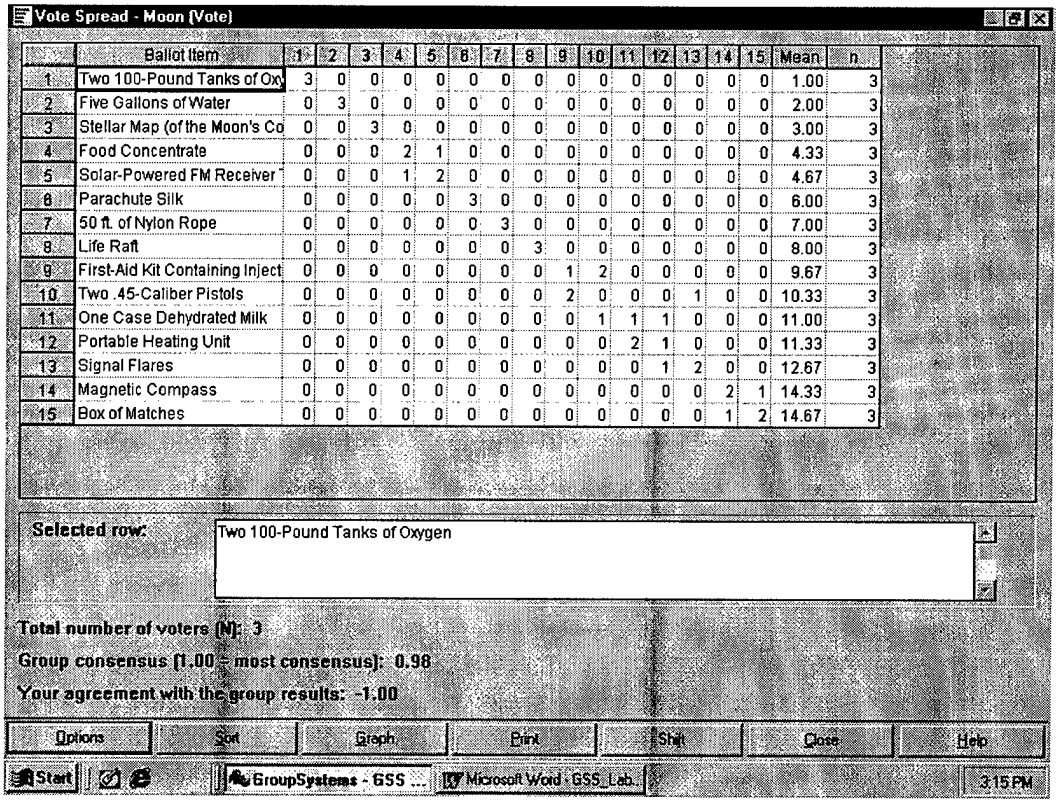
- PAUSE (1 minute)

- Facilitator says: "Once you are satisfied with your list order, cast your ballot by clicking on the "cast ballot" icon, which is the 2nd from the left. You will receive a dialogue box asking you to confirm your ballot. Please click yes and wait for further instructions."

- Ensure voting graph tool is set as follows:



- Facilitator: Open the result window to monitor individual votes. When n=number of participants, the group is done. Display the results with the projector and explain the level of group consensus.



- Facilitator says: "You have the next five minutes to discuss the results further using the GSS. If you are satisfied with the results let the facilitator know. If not you will be given the chance to vote again at the end of the five minutes."

- If group is satisfied with original outcome then go to STEP 2 else do the following:
  - Facilitator says: "Go ahead and vote again."
  - Facilitator: Open the result window to monitor individual votes. Assistant lets Facilitator know when the group is done. Display the results with the projector and explain the level of group consensus.
  - Facilitator says: "These are your final results. "

2. Facilitator stops Moon (Vote).

3. Facilitator flips DOWN projector

4. Facilitator says: "Feel free to take a quick 5-minute break in the prep room. Please don't discuss what color you are."

5. Assistant counts number of comments per subject and creates appropriate feedback and goal charts.

6. Facilitator stops Subjects in Moon Scenario -- Categorizer

Prep Room: Feedback

1. Subjects come back from break

2. Assistant says: "We would now like to give you a short questionnaire concerning your groups ranking on the task you just completed."

3. Assistant provides subjects with 5 item commitment to ranking Questionnaire

Goal and No Feedback or Goal Feedback Script

4. Assistant says: "During the group exercise just completed, your group worked together to solve a problem. Studies have shown that when individual members of the group participate fairly equally, the meeting will produce better results. For example, as you can see in the graph (show graph of equal proportion) the participation rates were almost equal among the group participants. The next graph shows participation rates where participants did not participate equally. What problem can result from the unequal levels of participation?"

5. (Wait for group to respond... Look for an answer such as subject 4 did not participate as much and he may have had the best answer while subject 2 dominated the meeting with his ideas. If group does not submit the answer looked for, provide an explanation.

6. Assistant says: "Studies have also shown that the more comments input during a meeting, the greater the chances to reach a high quality decision. In other words, the more ideas that are generated the better the chance the optimum solution will be found in those comments."

7. Assistant says: GOAL STATEMENT: "In the next task, try to participate equally while maximizing your number of comments."

IF GIVING FEEDBACK READ THE NEXT SECTION,
IF NOT STOP AND PROCEED TO NEXT TASK

8. Assistant says: "I will now show each of you a graph showing your participation level in the previous task."

9. Assistant provides an explanation of the feedback.

10. Assistant says: "Next to the bar graph of each individual show their score. Once all subjects have looked at the paper give them the paper to start the desert scenario."

11. Assistant says: "You will now be given 5 minutes to complete the desert scenario. Please follow the directions on the page."

12. Subjects individually complete Desert Scenario

13. Assistant says: "We will now move to the Task room to continue the task. Remember the goal to participate equally while maximizing your number of comments. Please take your desert scenario and questionnaire with you and place it in your manila folder."

14. Researchers move subjects to Task Room (GSS Room)

GSS Room: Experiment Two

1. Desert Scenario Script

➢ Facilitator says: "You will have 15 minutes to discuss the scenario as a group. The scenario you will be discussing is the same one you did previously as individuals. At the end of the 15 minutes you will each rank order the list individually. The ranking results will be consolidated as a group to indicate how well the group reached consensus. At this time the group will have another 5 minutes to determine if you have reached consensus. If the group did not reach consensus you should try to resolve any differences. The group will then individually rank the items again."

➢ Facilitator says: "During the 15-minute discussion period, focus on discussing each item's merits, not on where each item should be ranked. You will be able to rank order the list at the end of the 15 minutes. It is important to focus on discussion not on how to rank order since this could shut down conversation. It is normal to experience a lull during conversation, but this is part of group dynamics."

➢ Facilitator says: "Researchers will not answer questions dealing with the scenario during this session, but will assist with GSS questions. We will let you know when there are 5 and 2 minutes left in the session."

➢ Facilitators start participants in Desert (Categorizer).

➢ Facilitator says: "At this point, you should have been invited to join an activity. Please click on Yes." (Note to Researcher: In some cases this field will be blank.)

➢ Facilitator says: "Now you should be prompted to enter an author tag. Please click on OK."

➢ Facilitator says: "You have a list of 15 items and a category called "Group Discussion". Double Click on Group Discussion."

➢ Facilitator says: "Are there any questions?"

➢ Facilitator says: "You may begin group discussion on the Desert Scenario."

Time (min:sec)	Facilitator Entry
10:00	FACILITATOR INPUT: YOU HAVE 5 MINUTES LEFT TO DISCUSS THE SCENARIO IF NEEDED.
13:00	FACILITATOR INPUT: YOU HAVE 2 MINUTES LEFT TO DISCUSS THE SCENARIO IF NEEDED.

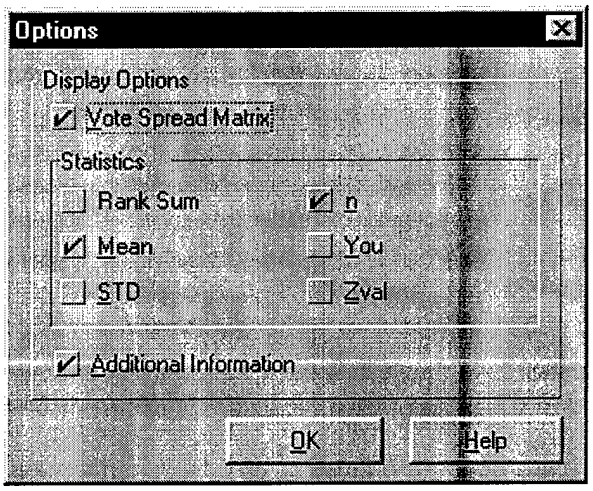
- Subjects finish initial discussion.
- Facilitator says: "Please close your Group Discussion Window."
- Facilitator says: "We will now open a voting tool for your use."
- Facilitator starts Desert (Vote).

- Facilitator says: "You have been invited to join the Voting activity. Please click yes. Now you should see the original list of items. Please begin voting by re-ordering the list now."

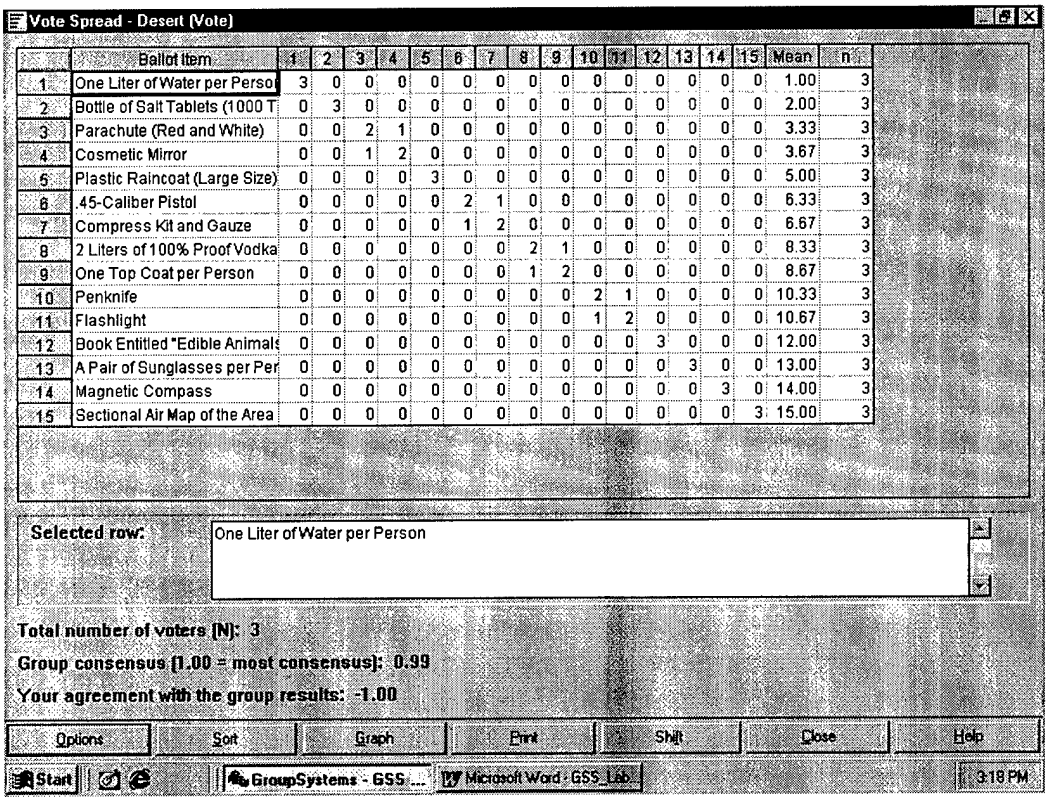
- PAUSE (1 minute)

- Facilitator says: "Once you are satisfied with your list order, cast your ballot by clicking on the "cast ballot" icon, which is the 2nd from the left. You will receive a dialogue box asking you to confirm your ballot. Please click yes and wait for further instructions."

- Ensure voting graph tool is set as follows:



- Facilitator: Open the result window to monitor individual votes. When n=number of participants, the group is done. Display the results with the projector and explain the level of group consensus.
- Facilitator flips UP projector



- Facilitator says: "You have the next five minutes to discuss the results further using the GSS. If you are satisfied with the results let the facilitator know. If not you will be given the chance to vote again at the end of the five minutes."

- If group is satisfied with original outcome then go to STEP 2 else do the following:
  - Facilitator says: "Go ahead and vote again."
  - Facilitator: Open the result window to monitor individual votes. Assistant lets Facilitator know when the group is done. Display the results with the projector and explain the level of group consensus.
  - Facilitator says: "These are your final results. "

2. Researcher stops Desert (Vote).

3. Facilitator flips DOWN projector

4. Facilitator says: "Lets go back to the prep room to finish up."

Prep Room: Wrap-Up

1. Assistant provides subjects with Post-Session Questionnaire

2. Subjects complete Post-Session Questionnaire

3. Assistant debriefs subjects
   "The experiment you just participated in was designed to measure the effect of feedback and goal setting on group performance, compare different levels of anonymity in a meeting on group performance, study ideation over time, and evaluate the influence of personality types on groups."

   "The experiment collected data on the quantity of comments provided, the quality of group decision, the timing of ideas generated, and participation rates from various personality groups."

   "I would like to thank you for your participation in this experiment. Do you have any other questions about the experiment you participated in today or on Group Support Systems?"

   [Pause for questions.]

   "Please, if you know others who are likely to participate in this experiment, please keep the details of the experiment to yourself in order to avoid biasing our final results and jeopardizing the continuation of this study."

4. Researchers collect all handouts, data, disks, etc. and ensures all are labeled

Appendix E: Consent Form

Study Overview

Welcome to the experiment. The following is a general description of the study and a reminder of your rights as a potential subject. As in any study, your participation is completely voluntary. If now, or at any point during the study, you decide that you do not want to continue participating, please let the experimenter know and you will be dismissed without penalty. Also, please remember that your name will not be associated with any of the information that you provide during the study. All of the information you provide is absolutely anonymous and confidential.

In this study, you will be working as part of a group to complete two group tasks. You will also be asked to complete two questionnaires during the study. You will first be given a questionnaire to complete, then you will complete the first task as a group, after a short break you will be given the second task to complete as a group, and finally, you will be given a second questionnaire to complete. The experimenter will give you more specific instructions later in the study. If you have any questions or concerns at this time, please inform the experimenter.

For further information

The Air Force Institute of Technology faculty members responsible for conducting this research are Maj. Michael Morris and Maj. Paul Thurston. They would be happy to address any of your questions or concerns regarding this study. Maj. Morris can be reached at 255-3636 ext 4578 and Maj. Thurston can be reached at 255-6565 ext 4315.

If you would like to participate in this study, please sign in the space provided. Your signature indicates that you are aware of each of the following: 1) the general procedure to be used in this study, 2) your right to discontinue participation at any time, and 3) you and your name will not be associated with any of the information you provide.

Printed Name: _____

Signature:_____ Date:_____

Appendix F: Personality Test

Answer the questions using the following scale.

1. Very Inaccurate
2. Moderately Inaccurate
3. Neither Accurate Nor Inaccurate
4. Moderately Accurate
5. Very Accurate

____1. I trust others.

____2. I complete tasks successfully.

____3. I would never cheat on my taxes.

____4. I like order.

____5. I am easy to satisfy.

____6. I avoid mistakes.

____7. I believe that people are essentially evil.

____8. I don't see the consequences of things.

____9. I obstruct others' plans.

____10. I am not bothered by disorder.

____11. I hold a grudge.

____12. I often make last-minute plans.

____13. I believe that others have good intentions.

____14. I excel in what I do.

____15. I stick to the rules.

____16. I like to tidy up.

____17. I can't stand confrontations.

____18. I choose my words with care.

____19. I am aware of others.

____20. I have little to contribute.

Answer the questions using the following scale.

1. Very Inaccurate
2. Moderately Inaccurate
3. Neither Accurate Nor Inaccurate
4. Moderately Accurate
5. Very Accurate

____21. I take advantage of others.

____22. I am not bothered by messy people.

____23. I get back at others.

____24. I act without thinking.

____25. I trust what people say.

____26. I handle tasks smoothly.

____27. I use flattery to get ahead.

____28. I want everything to be "just right".

____29. I hate to seem pushy.

____30. I stick to my chosen path.

____31. I suspect hidden motives in others.

____32. I don't understand things.

____33. I pretend to be concerned for others.

____34. I leave my belongings around.

____35. I insult people.

____36. I do crazy things.

____37. I believe that people are basically moral.

____38. I am sure of my ground.

____39. I use others for my own ends.

____40. I love order and regularity.

Answer the questions using the following scale.

1. Very Inaccurate
2. Moderately Inaccurate
3. Neither Accurate Nor Inaccurate
4. Moderately Accurate
5. Very Accurate

____41. I have a sharp tongue.

____42. I jump into things without thinking.

____43. I distrust people.

____44. I misjudge situations.

____45. I put people under pressure.

____46. I do things according to a plan.

____47. I yell at people.

____48. I rush into things.

____49. I believe in human goodness.

____50. I come up with good solutions.

____51. I know how to get around the rules.

____52. I leave a mess in my room.

____53. I contradict others.

____54. I make rash decisions.

____55. I think that all will be well.

____56. I know how to get things done.

____57. I cheat to get ahead.

____58. I often forget to put things back in their proper place.

____59. I love a good fight.

____60. I like to act on a whim.

___ Male ___ Female ___ Married ___ Single Age:_____

Highest Education Level Completed (please choose one):
___ High School ___ Bachelor's Degree ___ Graduate Degree
___ Some College ___ Some Graduate Studies ___ Post Graduate Degree
For Bachelor's, Graduate, and Post Graduate Degree recipients, please enter the type of degree conferred (e.g., BS Computer Science, MBA, BA MIS, etc.):
Bachelor's:_____
Graduate:_____
Post Graduate:_____

If active duty military, enter the number of years you've spent on active duty:_____

If civilian with prior military service, enter the number of years spent on active duty:_____,
and the number of years of paid employment not including prior military service:_____

If civilian with no prior military service, enter the number of years of paid employment:_____

Current occupational specialty or occupation:_____
(e.g., Communications & Information, Logistics, Management, Teacher, etc.)

Number of years supervisory experience:_____

Approximately how many years have you used a computer?
___ Less than 1 ___ 1-5 ___ 6-10 ___ 10 or more

Approximately how many hours per week do you currently use a computer (work and home)?
___ 0-10 ___ 11-20 ___ 21-30 ___ 31 or more

Answer the remaining questions using the following scale.
1 – Very Inaccurate
2 – Moderately Inaccurate
3 – Neither Accurate Nor Inaccurate
4 – Moderately Accurate
5 – Very Accurate
___ I feel comfortable using e-mail
___ I feel comfortable programming a computer
___ I feel comfortable using MS Word and other desktop software tools
___ I am a proficient typist
___ I feel comfortable navigating around the Internet
___ I am knowledgeable about computer networks
___ I am comfortable learning how to use new computer software
___ Overall, I am proficient at using personal computers (PCs)

Appendix G: Plots of Participation by Characteristic

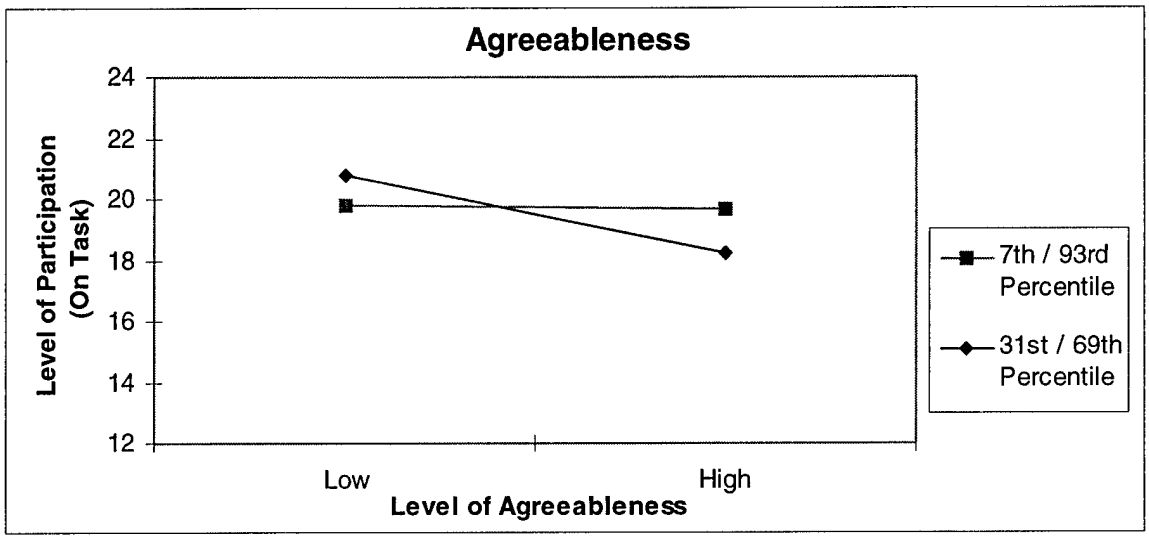


Figure 15: On-Task comments for Agreeableness

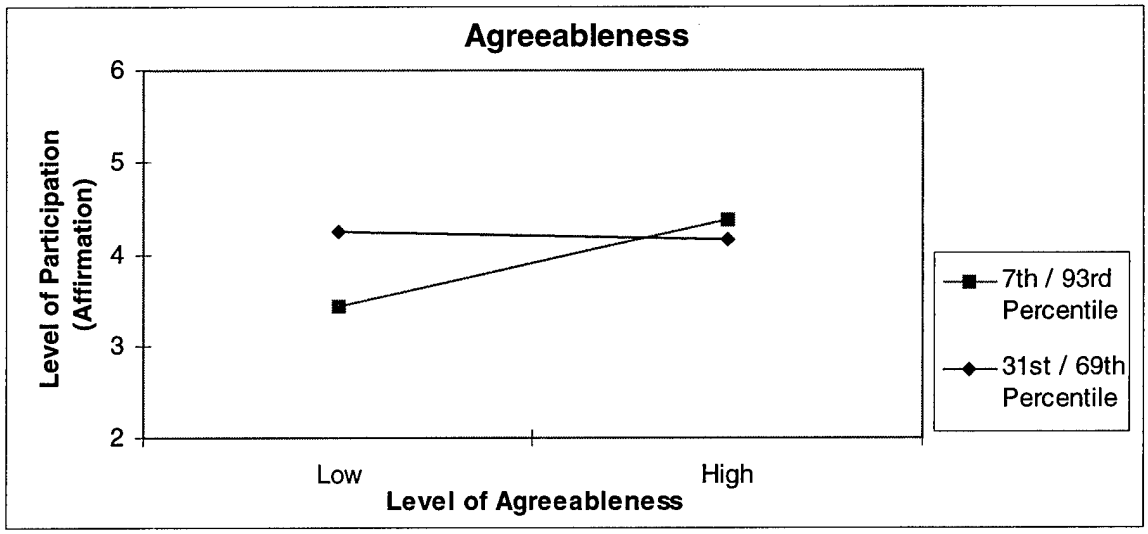


Figure 16: Affirmation Comments for Agreeableness

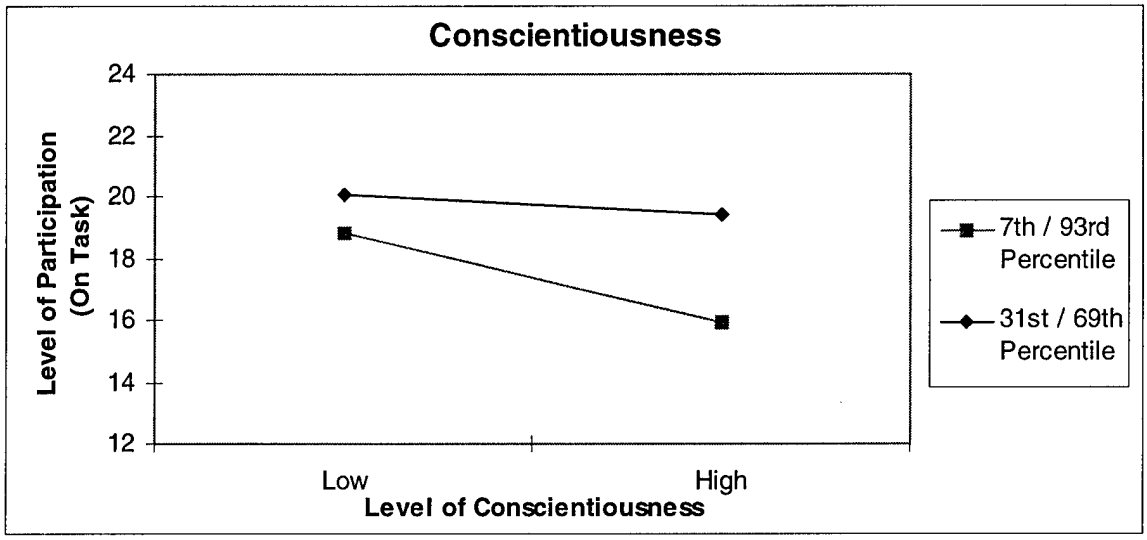


Figure 17: On-Task Comments for Conscientiousness

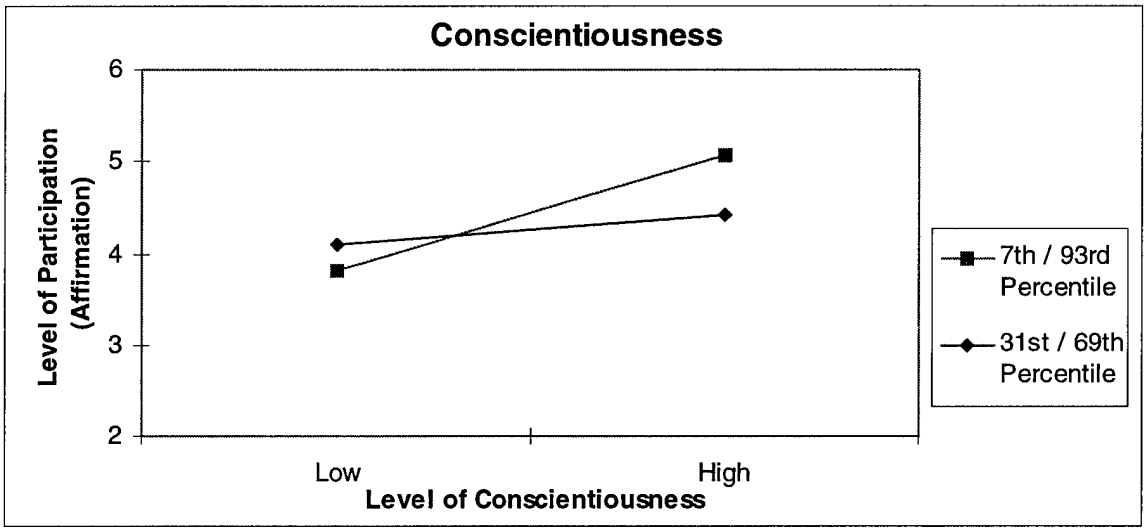


Figure 18: Affirmation Comments for Conscientiousness

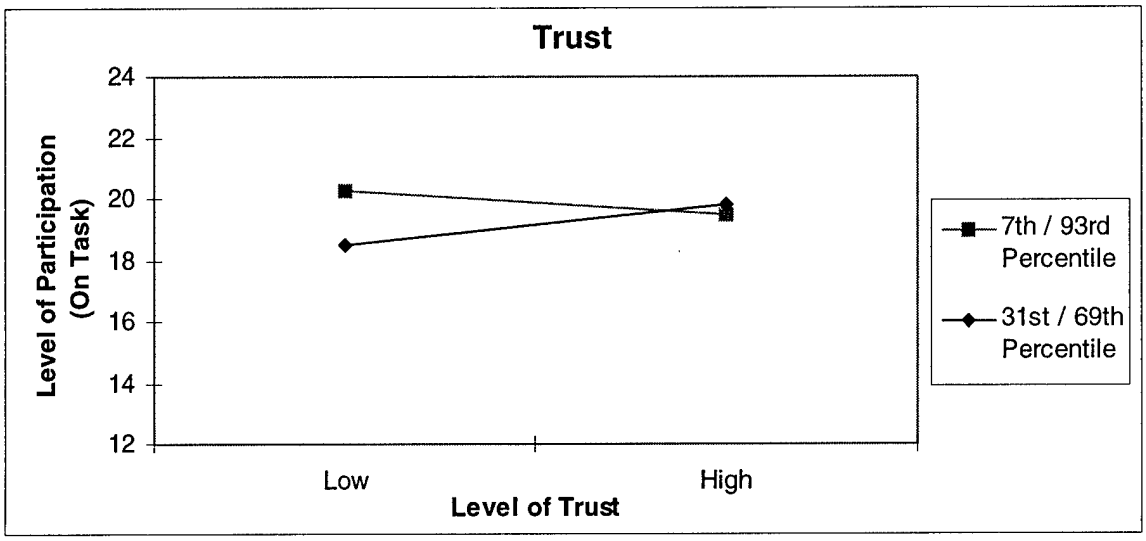


Figure 19: On-Task Comments for Trust

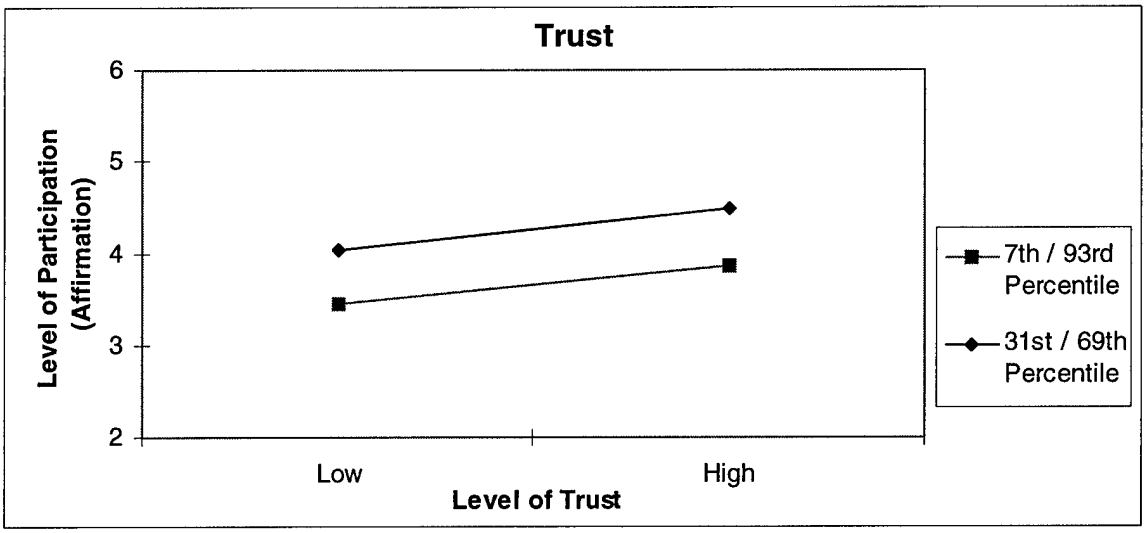


Figure 20: Affirmation Comments for Trust

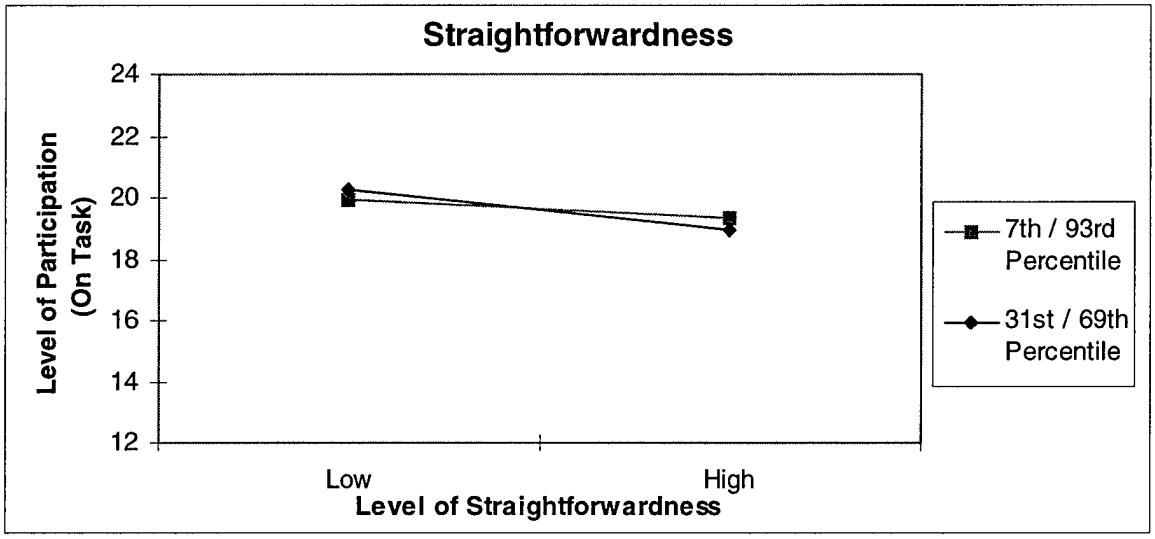


Figure 21: On-Task Comments for Straightforwardness

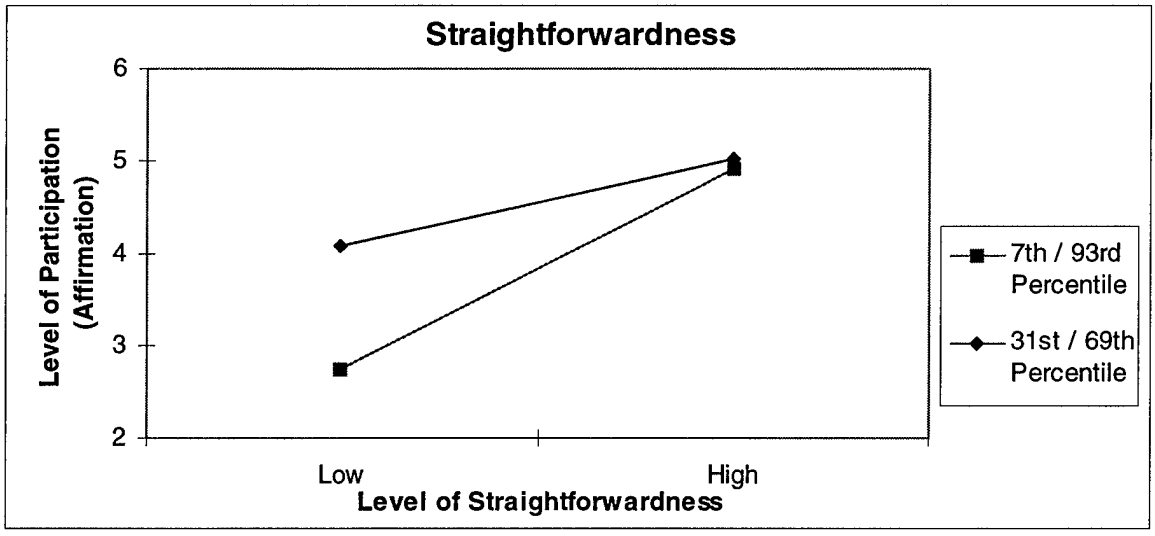


Figure 22: Affirmation Comments for Straightforwardness

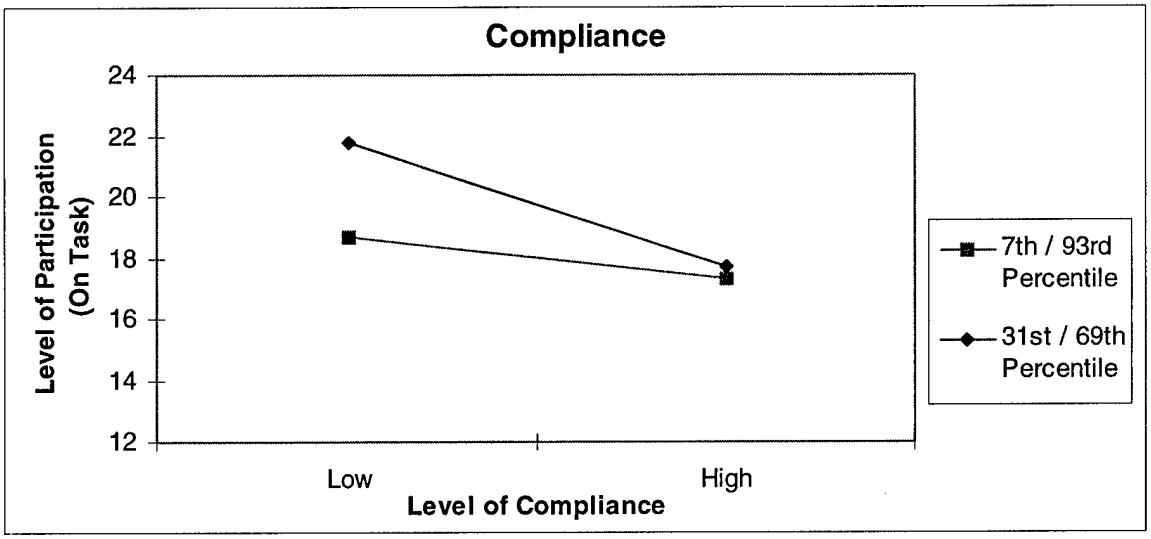


Figure 23: On-Task Comments for Compliance

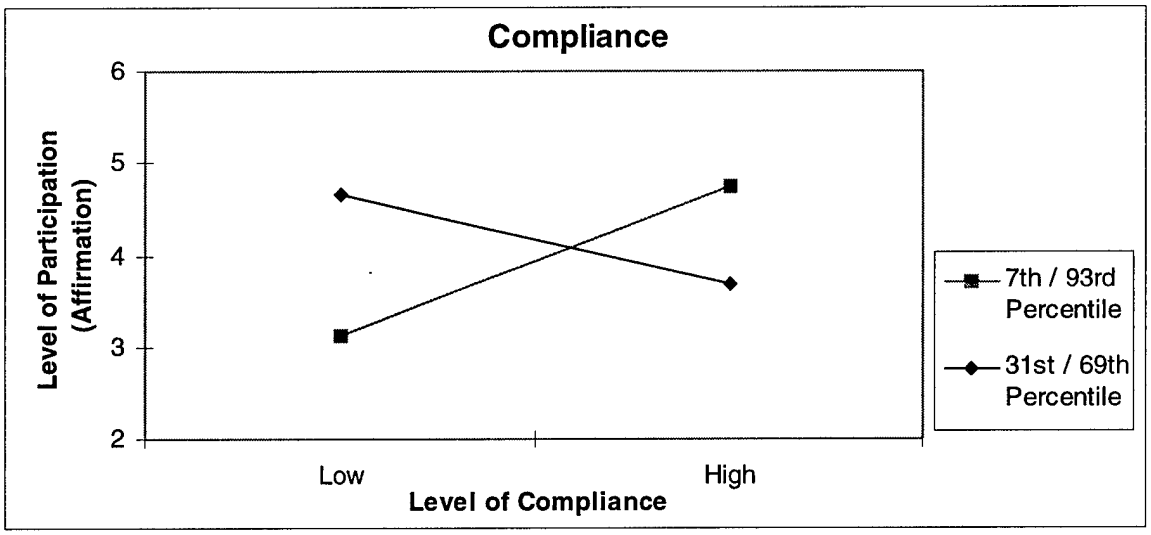


Figure 24: Affirmation Comments for Compliance

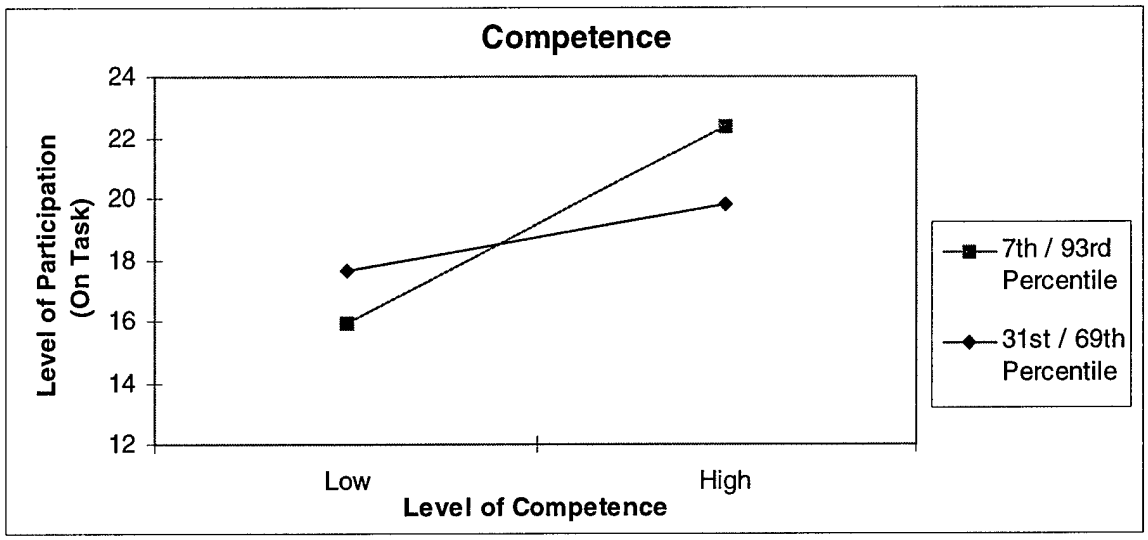


Figure 25: On-Task Comments for Competence

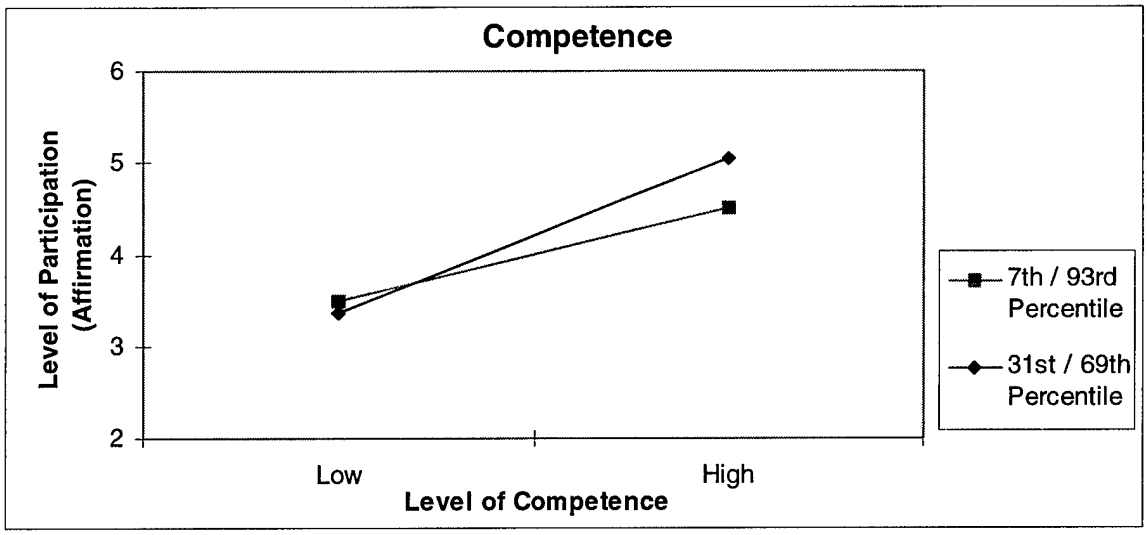


Figure 26: Affirmation Comments for Competence

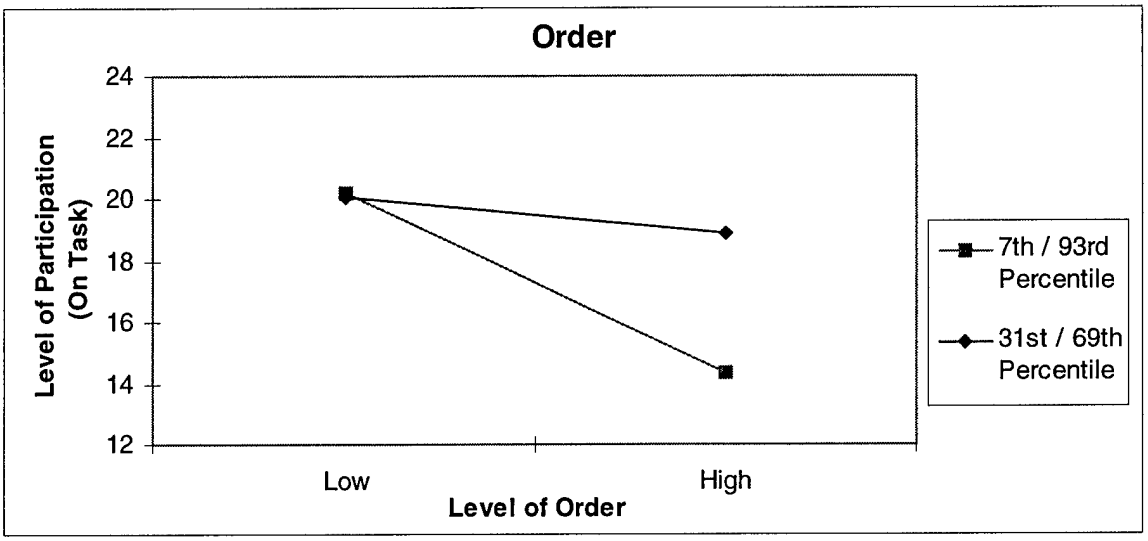


Figure 27: On-Task Comments for Order

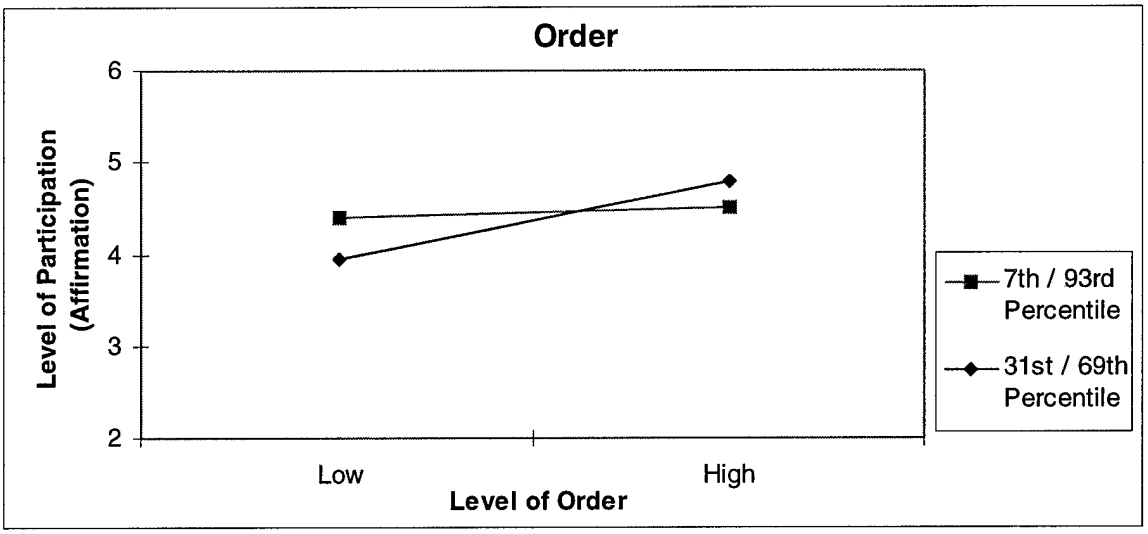


Figure 28: Affirmation Comments for Order

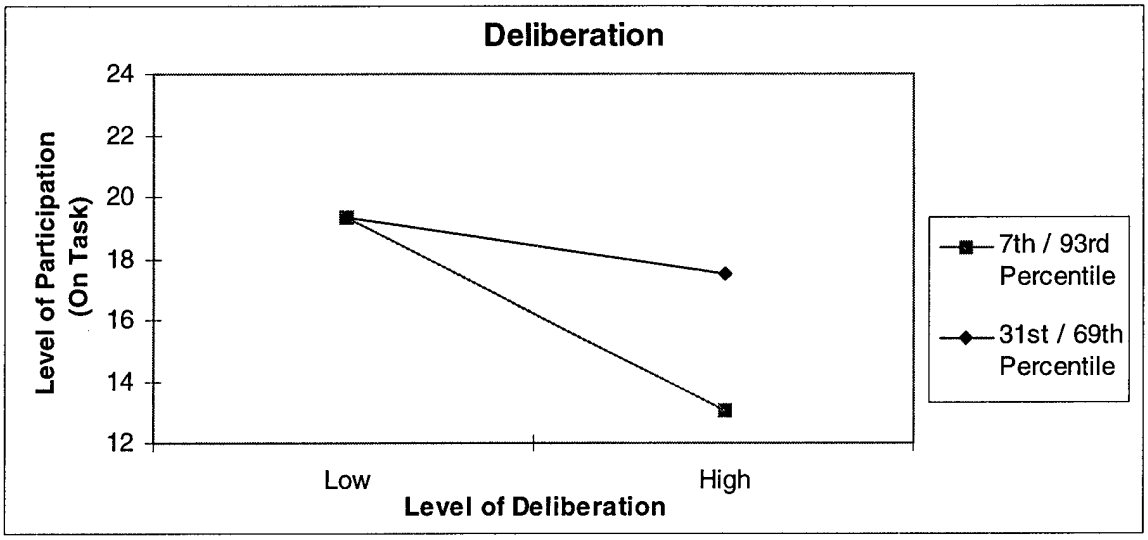


Figure 29: On-Task Comments for Deliberation

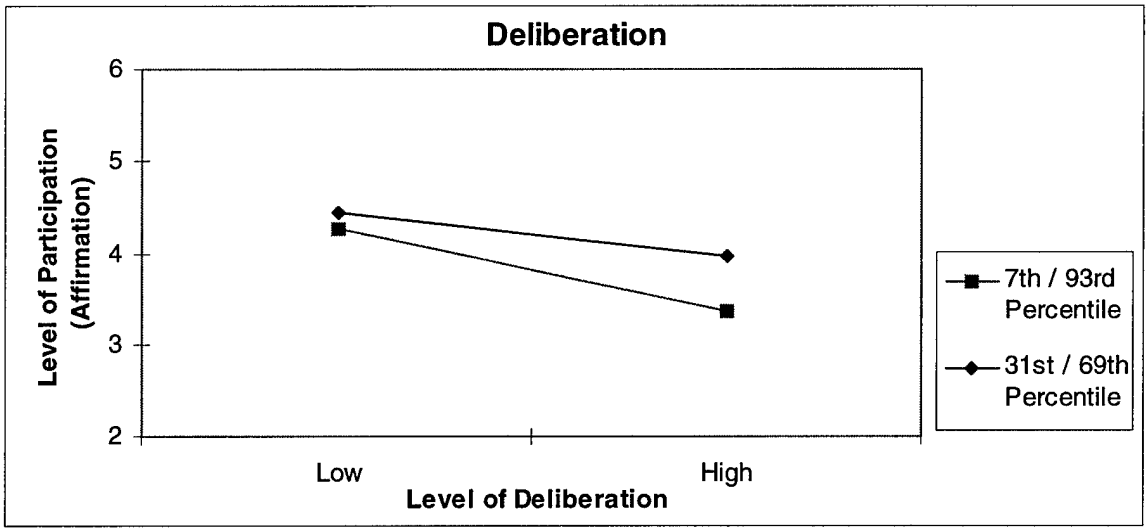


Figure 30: Affirmation Comments for Deliberation

Appendix H: Plots for the Insignificant Effects of Anonymity

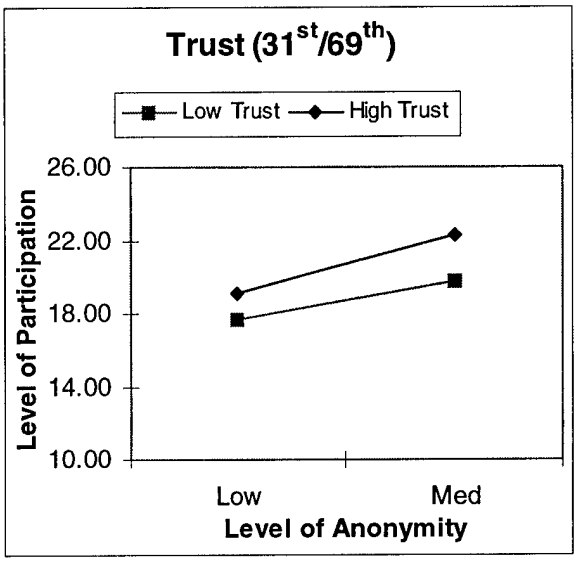


Figure 31: Trust moderated by anonymity at the 31st/69th percentile

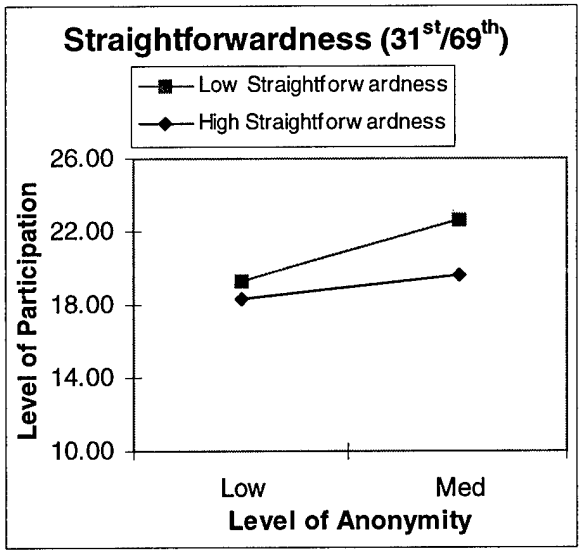


Figure 32: Straightforwardness moderated by anonymity at the 31st/69th percentile

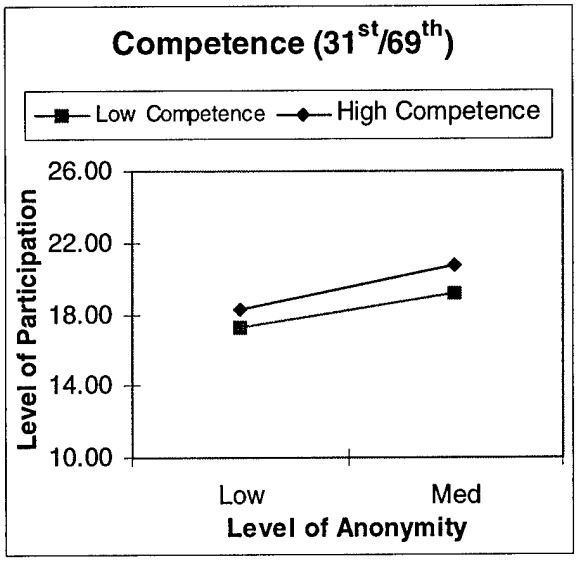


Figure 33: Competence moderated by anonymity at the 31st/69th percentile

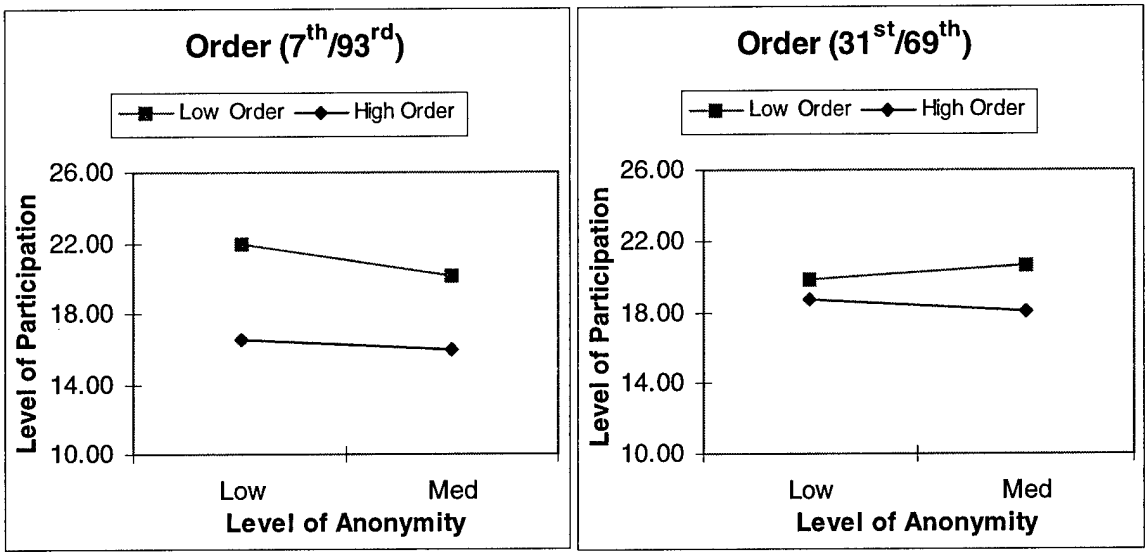


Figure 34: Order moderated by anonymity at both percentiles

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Vita

Captain Robert E. Hartmann was born in Cincinnati, Ohio. He graduated from Glen Este High School in Mount Carmel, Ohio in 1982. He entered undergraduate studies at Cincinnati State Technical College in Cincinnati, Ohio where he graduated with an Associates of Science degree in Management Information Systems in August 1984. He enlisted in the Air Force in February 1985.

His first assignment was at the Air Force Personnel Center, Randolph AFB as a programmer/analyst. While stationed at Randolph AFB, he attended Texas Lutheran College in Seguin, Texas where he graduated with a Bachelors of Science degree in Computer Science in December 1991. In May 1992, he was assigned to the Air Force Flight Test Center, Las Vegas, Nevada also as a programmer/analyst. While there, he was accepted to Officer Training School and attended the November 1993 class where he earned his commission. After graduating from OTS and technical training school he was assigned to the Air Force Research Laboratory, Wright-Patterson AFB in June 1994 as a Digital Simulation Research Engineer. While at Wright-Patterson AFB, he was assigned to an extended temporary duty from July 1995 to June 1996 for the Hands-on Threat Demonstration Program, Kirtland AFB as a Systems Engineer. In November 1997 he was assigned to the Air Force Operational Test and Evaluation Center, Kirtland AFB as a Software Test Manager. In August 1999 he entered the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to the Air Force Communication Agency, Scott AFB.

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14. ABSTRACT

A group support system (GSS) uses a combination of networked personal computers, software that collects, manipulates, and aggregates member's individual input, and human facilitation to improve the group decision-making process. A GSS has been promoted as a means of improving the quantity and quality of ideas within a decision-making meeting. Research into GSS has focused on the benefits of providing anonymity to improve participation. Anonymity in a GSS meeting has been offered as a means to improve participation, which in turn improves decision quality. To date this has not been proven through research. In fact, there is conflicting evidence as to what the actual effects of anonymity are.

Research in social psychology provides a possible explanation for the conflicting results of the effects of anonymity. An individual's personality characteristics can effect how they participate in a decision-making meeting. The study examined how an individual's personality type and varying degrees of anonymity influence individual participation in a GSS meeting. The results of the study suggest personality characteristics have a significant impact on participation within a GSS supported meeting. Further, the results suggest personality and its interaction with anonymity has a positive effect on participation for some individuals, but not all. Consistent with most prior GSS studies, the results suggest anonymity does have a positive effect; however, this effect was significant only for certain personality traits.

15. SUBJECT TERMS

Group Support System (GSS), Anonymity, Personality, Five-Factor Model, Group Problem Solving

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