

Personalities of Design Thinking

Emily Callaghan

Emily.callaghan@gmail.com

(785) 550-7748

1218 S. Farmer Avenue #101

Tempe, Arizona

85281

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INTRODUCTION

The power of working in teams is no secret and in New Product Development (NPD) the trend of cross-functional teams is becoming the industry standard. “Cross-functional teams are beginning to play an important role in the quest for innovative solutions to today’s complex problems” (Bradley & Hebert, 1997, p. 350). The foundation of this study is built on the idea that design thinking is analogous Creative Problem Solving (CPS), developed by Alex Osborn. CPS is a multi-faceted research topic and brainstorming is one commonly practiced CPS method. This study paired Myers-Briggs Type Indicator® (MBTI) personality types with performance factors in group brainstorming of cross-functional NPD teams in a university setting in order to understand opportunities for better brainstorming. In an effort to define and apply design thinking to current processes, this paper reviews the connections between MBTI type and performance. As design managers, it is essential to know the capabilities of teams. This study provides a first step in understanding team brainstorming performance at a new level.

A new, 3-part performance model was proposed and tested to understand performance not just by numbers of ideas, but in a more meaningful way through satisfaction and involvement of individuals and actionability of ideas generated. After all, the ultimate intention of brainstorming is to generate ideas with actionable results. The question this study answered is—What, if any, are the connections between MBTI personality type and performance in group brainstorming among cross-functional New Product Development teams? The results help understand more about the factors of design thinking in order to improve management of brainstorming, an essential process in the NPD process.

TERMS

Maximum Performance: The combination of highest levels of involvement, satisfaction and actionability of ideas generated in a brainstorming session.

Involvement: Level of involvement of the individual during brainstorming sessions, as can be observed through number of utterances, or ideas offered per individual.

Satisfaction: Satisfaction in and of itself is a completely subjective term. At the end of each brainstorming session each individual was given a survey and asked to respond to satisfaction statements using a Likert-scale of agreement or disagreement. This means that there were many subjective ideas of what “satisfaction” means as there are surveys.

Actionable Idea: An idea generated in a brainstorming session that was worthy of further development in the NPD process. Actionability, like satisfaction is subjective in nature. This study relied upon the feedback from the expert judges from Herman Miller. The reliance upon the client sponsor in this circumstance mimics that of the client in a design consultancy new product development context. Therefore, despite its subjective nature, actionability in this study is still representative of a professional project.

CONTEXT

The context of this study was explored through a review of existing literature that focused on New Product Development, brainstorming and the MBTI assessment. Organizations have employed teams as the primary means toward harnessing the creativity necessary to remain vital and effective (Mohrman, Cohen & Mohrman, 1995). Hargadon states, “So whereas innovators may often feed the romantic myth of the lone inventor, breakthrough innovations are more likely the products of groups” (2003, p. ix). The pressure to innovate in the industry shows no signs of letting up. It is time to explore and understand team performance. Brainstorming often takes credit for big, innovative ideas. This study answers a need to dive deeper into brainstorming in the NPD context.

A significant portion of the brainstorming literature focuses on two facts. The first fact relies on past literature largely which shows that individuals generating ideas alone and aggregated to the group level (“nominal groups”) outperform live group brainstorm (Mullen, Johnson & Salas, 1991; Diehl & Stroebe 1991; Sutton & Hargadon, 1996). Despite that evidence, the second fact is that group brainstorming persists as a commonly practiced and popular method for generating ideas for creative tasks in organizations. Diehl & Stroebe, 1991, talk about brainstorming as “...still very widely used in

industry, advertising, and other commercial settings, despite overwhelming empirical evidence for its ineffectiveness” (p. 392). Yet, people consistently perceive creative groups to be more effective (Homma, Tajima & Hayashi, 1995; Paulus, Larey, & Ortega, 1995) and believe that groups will help to produce higher quality ideas (Rowatt, Nesselroade, Beggen & Allison, 1997) than individuals alone.

Brainstorming research continues to struggle between the individual and the group in search of superior performance. It is important to note, however, that past performance metrics have focused on quantity of ideas alone.

The Myers-Briggs Type Indicator® (MBTI) is a validated, tested, and easily accessible personality inventory and has been widely used throughout organizations for many years (Levesque, 2001). It has been tested extensively for validity and reliability (Bradley & Hebert, 1997). It is one of the most widely used instruments for non-psychiatric populations (Capraro & Capraro, 2002; Boyle, 1995; Thompson & Ackerman, 1994; Murray, 1990) and has been used extensively in business (Bradley & Hebert, 1997). Bradley & Hebert state, “Personality-type theory is important in understanding each person’s strengths and weaknesses and the way these factors influence team formation and development” (1997, p. 344). Based on their 1997 study looking at personality types and team performance, the data suggested, “that personality types are an important factor in successful team performance” (p. 350). The test has shown to be helpful for individuals to understand themselves and also understanding differences among others, which can be particularly helpful in a team setting.

QUESTION: What, if any, are the connections between MBTI type and brainstorming performance among cross-functional New Product Development teams?

CONCEPTUAL FRAMEWORK

The NPD process can be distilled into three main phases: research, ideation and implementation. (Adapted from Cagan and Vogel’s product development process map, 2002, p.110) This study focused on the ideation phase, specifically brainstorming. As shown below, in Figure 1, the study focused on MBTI®

personality types and brainstorming techniques and how those variables relate to a new, 3-part maximum performance model. The three parts of maximum performance are discussed in more detail later.

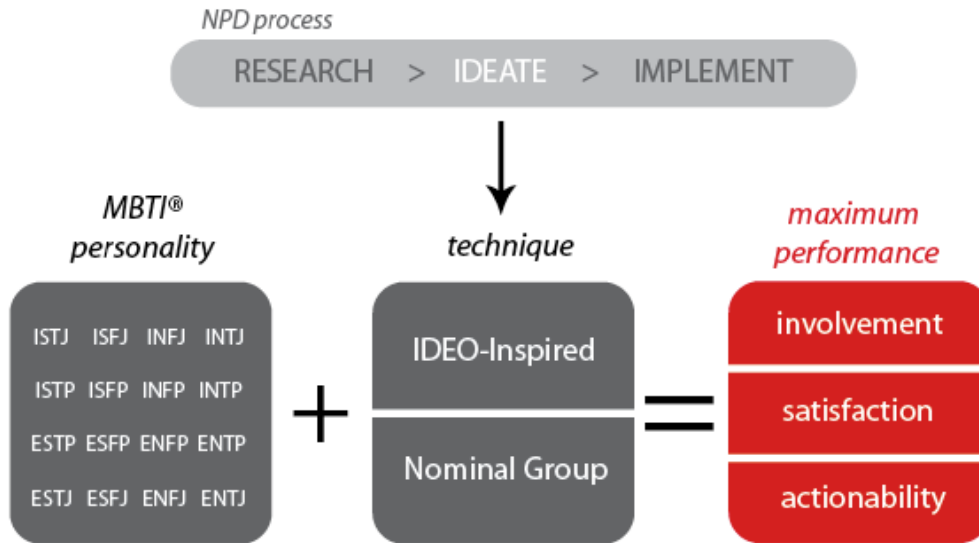
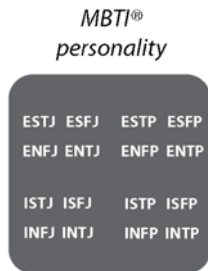


Figure 1. Conceptual Framework

MORE ABOUT MBTI



The MBTI is based on 4 scales:

1. How a person is energized – designated by extrovert (E) versus Introvert (I).
2. What information a person perceives – designated by sensing (S) versus intuition (N).
3. How a person decides – thinking (T) versus feeling (F)
4. The life-style a person adopts – judging (J) versus perceiving (P).

(Bradley & Hebert, 1997, 341)

The results of the test assign the test taker to one side of the “energized” continuum, ultimately determining them and “E” or an “I”. The same follows suit for perception information (“S” or “N”),

decision making (“T” or “F”) and lifestyle (“J” or “P”). Each person that takes the test, then, has a 4-letter outcome, such as INFP or ESTJ. There are 16 total combinations or types. The purpose of the MBTI is to “identify, from self-report of easily recognized reactions, the basic preferences of people in regard to perception and judgment, so that the effects of each preference, singly and in combination, can be established by research and put to practical use” (Myers & McCaulley, 1989, p. 1). This study, focused on two of the four scales: Extrovert/Introvert and Judging/Perceiving.

EXTROVERT/INTROVERT

“The study around application of the MBTI® instrument has led to a better understanding of how to help individuals build on their strengths, overcome certain blocks and barriers that results from their personality preferences, and thus become more effective” (Levesque, 2001, p. 9). In this study, the understandings available through the assessment results were chiefly used to interpret different levels of maximum performance—satisfaction, actionability and involvement. Although the test has proven effective for personal understanding, results in this context were tools for the researcher during analysis. The Extrovert/Introvert distinction involves an individual’s attitudes or orientations toward the world (Levesque, 2001), whether overall attitude toward the world is oriented outward to other persons and objects (E) or is internally oriented (Capraro and Capraro, 2002). Extroverts look out and re-energize around others, and Introverts look in, re-energizing alone. Levesque states then if you are an Extrovert, you “give top priority to the objects and people around you” and that “You tend to focus interest and attention on what is happening in the world, who is doing or saying what, and what is going on” (2001, p. 14). Particularly relevant to this study, Levesque talks about creativity and ideas as an Extravert: “Your creativity is built around interacting with others. You find it easy to share experiences with others, and you readily volunteer your thoughts” (2001, p. 14). A simple way to approach how Extroverts and Introverts interact with the world around them is that Extroverts *speak, think, speak* and Introverts *think, speak, think*. Judging and Perceiving functions are also a focus in the scope of this study.

JUDGING/PERCEIVING

As Hirsch and Hirsh remind their readers, it is important to remember that “Type is about preferences; type is *not* about knowledge, skills or abilities” but instead preferences (2003, p. 2). The Judging/Perceiving functions are decision-making preferences. The differences are distinguished “...between making prompt decisions, a preference for planning and organizing activities—judgment (J)—versus a preference for flexibility and spontaneity—perception (P)” (Capraro and Capraro, 2002, p. 593). Judging types feel more at ease with having a schedule, and more uneasy when things are uncertain and not planned or scheduled. Perceiving types feel more at ease when things are not scheduled, and schedules or plans tend to make them feel uneasy.

Based on the previous discussion, creativity and groups researchers alike seem to agree that heterogeneity is the key to any group potential on a complex task; however, the question remains about what kind of heterogeneity is the best measure of that potential (Kurtzberg, 2005). Creativity, especially in groups, is primarily a thinking problem, which can benefit from an effective problem-solving process (Kurtzberg & Amabile, 2001). This study responds directly to Kurtzberg’s inquiry about measuring potential in heterogeneity. Results will show the relationships of heterogeneity of group brainstorming in a new way—through the MBTI.

MBTI tests were administered at the start of the yearlong program and used during analysis of this study. Types for participants are below (see Table 3).

MBTI Type	Team	Discipline
ENTP	1	Industrial Design
ESTJ	1	Visual Communication Design
ENTJ	1	Engineering
ISTJ	1	Business
ISFP	2	Industrial Design
ESTJ	2	Visual Communication Design
ENFP	2	Engineering
ISTJ	2	Business
INTP	3	Industrial Design
ESTJ	3	Visual Communication Design
ISTJ	3	Engineering
ISFJ	3	Business

Table 1. MBTI Types per team/discipline

TECHNIQUES



Two techniques were used in this study: the Nominal Group Technique (NGT) (Delbecq & VandeVen, 1971) and an IDEO-Inspired Technique. The two techniques were chosen because of the differences between them. The NGT is highly structured and involves individual idea generation followed by a round robin style of idea sharing, orchestrated by the facilitator. The IDEO-Inspired Technique, however, was much more loosely structured. Student teams were asked to contribute ideas (without independent idea generation) spontaneously, as they thought of them, on post-its and offer them to the facilitator/scribe.

A NEW! 3-PART MAXIMUM PERFORMANCE MODEL



Figure 2. NEW 3-Part Maximum Performance Model

The study employed a 3-part performance model incorporating involvement and satisfaction at the individual level and actionability of ideas generated. This robust model was developed in response to past literature in brainstorming.

The first part of the model, Involvement, was measured on the individual level and this responds to Osborn's principle that *quantity yields quality*. The principle is based on the premise that "the more ideas you think up, the more likely you are to arrive at the potentially best leads to a solution" (Osborn, 1963, p. 124). Involvement was measured as the number of ideas generated per individual.

The second part of the model, satisfaction, was included because despite the literature on the individual's ability to outperform groups in brainstorming, group brainstorming remains popular. People enjoy brainstorming. Investigating levels of satisfaction will help understand the personal affect that may relate to performance. As noted, a significant amount of brainstorming literature focuses on the inferiority of group brainstorming as compared to individual brainstorming. Despite the research refuting the value of group brainstorming, it persists as a popular Creative Problem Solving (CPS) technique. New Product Development (NPD) teams continue to embrace the tool as part of their development process. Part of this persistence could be attributed to the enjoyment or satisfaction element of a group brainstorm.

Participants enjoy brainstorming and view it very positively (Paulus, 2000; Paulus, Larey & Ortega, 1995). At IDEO, "designers laughed, joked, and smiled in brainstorms, described them as 'a vacation' and 'fun,' and agreed with the survey item that 'Brainstorms are one of the most fun things I do at IDEO'" (Sutton & Hargadon, 1996, p. 692). It is possible that feeling creative can, in turn, inspire positive emotions (Kurtzberg, 2005). Based on the literature, affect of experience is consistently an important factor to participants of group brainstorms.

Finally, the third part of the model, actionability, speaks to the ultimate motivation to brainstorm in the first place—generating that big idea that can be developed further. In this case, actionability was defined in relation to the NPD process. An actionable idea was defined in this study as an idea with enough potential value to advance in the NPD process for further exploration and/or development. Actionability of ideas generated could be determined a number of different ways, but this study asked expert judges from Herman Miller to determine which ideas qualified as "actionable".

Brainstorming is commonly used in New Product Development, but is only one tool of a larger CPS process. Since its inception in 1938, organizations and teams have readily adopted brainstorming.

The focus of the past literature has been on the individual and the team and the factors attributing to performance or lack thereof. The true challenge in New Product Development teams practicing brainstorming isn't whether the individual can do it better, but how to move toward maximum performance as a team. The new, 3-part model offered provides a first step toward better understanding the needs of NPD teams today.

SAMPLE

Participants for the study were selected due to their enrollment in INNOVATIONSPACE, an educational new product development research laboratory at Arizona State University (ASU). INNOVATIONSPACE is a yearlong undergraduate program that is composed of senior-level students. The program's students are divided into 9 teams, with 4 students in each team. Within each of those teams is one student from each of the following disciplines: Industrial Design, Visual Communication Design, Business and Engineering. The students of the INNOVATIONSPACE program are a natural participant sample because of the similarities within the program and with that of industry: cross-functional team composition coupled with the innovation driver being New Product Development.

There were three sponsors of the student teams in the 2007-08 academic year. Two industry sponsors—Intel and Herman Miller, Inc.—and one ASU sponsor, The Center for Nanotechnology in Society. The three Herman Miller teams were chosen for this study, a total of 12 students. Each team had two female and two male participants. The industry sponsor was an important consideration because the sponsor role in INNOVATIONSPACE is much like that of a client for a design consultancy pursuing an NPD project. Therefore, The Center for Nanotechnology in Society, and ASU research sponsor, was not considered in team selection. In order to select between Herman Miller and Intel teams, the uniqueness of MBTI types were compared between the groups of teams. Herman Miller teams had 8 unique types and Intel had only 7. In order to the greatest breadth during the data collection, Herman Miller teams were selected.

Furthermore, the INNOVATIONSPACE program had two Herman Miller sponsor contacts that were directly involved with design research and new product development at Herman Miller while also

being involved with the three INNOVATIONSPACE teams. The Herman Miller sponsors were ideal judges to determine actionability of ideas generated by student teams, as they were often required to do so in their professional work.

BRAINSTORMING SESSIONS

All student teams were at the same point in the new product development process when the brainstorming took place. The sessions were conducted in a linear fashion (non-consecutively) during class periods; all were complete within one week's time. Student teams were asked to generate POGs (Cagan & Vogel, 2002) or Product Opportunity Gaps to explore in the brainstorming process.

Three brainstorming sessions were conducted. Student participants as well as guests, including experts from the field of interest and team sponsors, brainstormed together. Guests were present at all three sessions. Guest participation was not part of data collection. The first session included all 12 participants and the Nominal Group Technique was used and facilitated by a guest (see Figure 3). During this session, one POG from each group was explored, for a total of 3 POGs. The second session also included all 12 participants, but the IDEO-Inspired Technique was used and facilitated by guest facilitators, one facilitator for each POG explored (see Figure 4). Again, one POG from each group was explored, for a total of three POGs. Finally, in the third session (see Figure 5), each team of 4 brainstormed independently and was allowed to choose which technique they wanted to use and they were to facilitate themselves or ask a guest to facilitate the process. Teams were asked to explore POGs not previously examined.



Figure 3. Team composition, Brainstorming session one: Nominal Group Technique



Figure 4. Team composition, Brainstorming session two: IDEO-Inspired Technique



Figure 5. Team composition, Brainstorming session three: Choice of Technique

DATA COLLECTION

Data were collected in response to the 3-part maximum performance model (see Figure 2). Involvement data were collected through video observation. Each session was taped and later viewed, when numbers of ideas offered per individual were tallied. Satisfaction data were collected through post-brainstorming surveys that were administered at the end of each session. Finally, expert judges from Herman Miller, Inc determined actionability. At the end of all brainstorming sessions, teams grouped their ideas and judges marked “actionable” ideas, using the operational definition of actionable for this study: an idea worthy of further exploration/moving forward in the NPD process.

RESULTS: INVOLVEMENT

SESSION 1: Nominal Group Technique

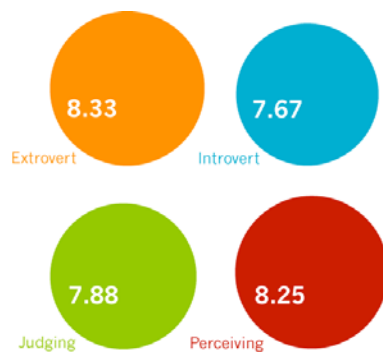


Figure 6. Average number of ideas offered per individual per personality type, Nominal Group Technique

SESSION 2: IDEO-Inspired Technique

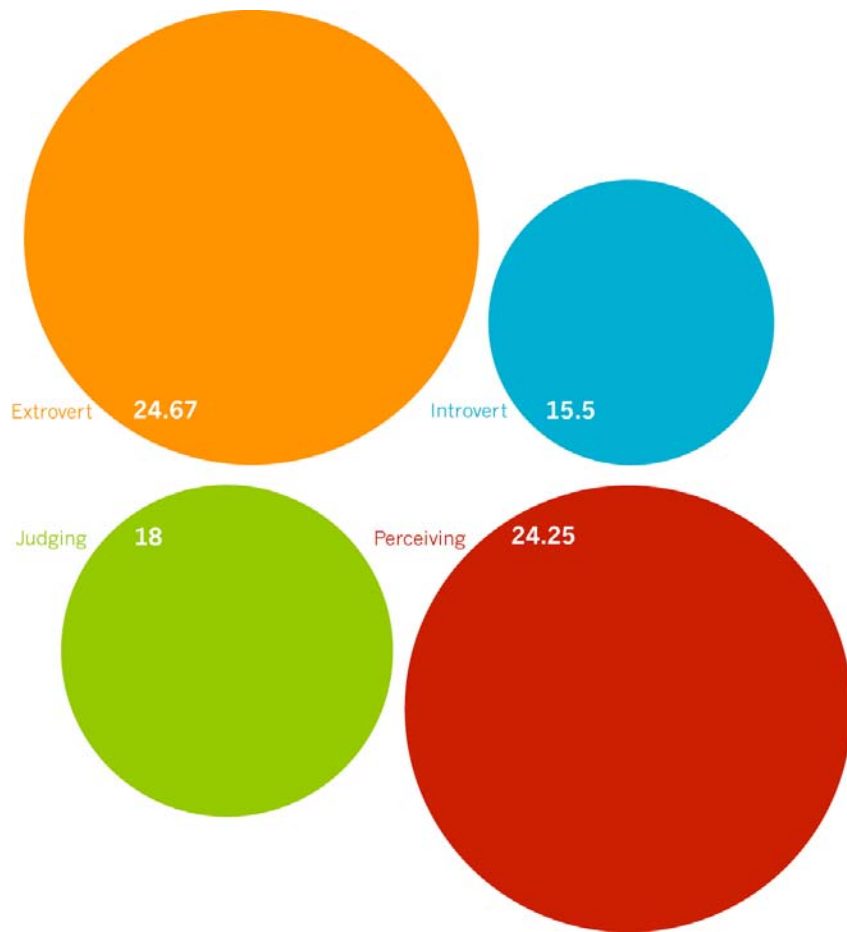


Figure 7. Average number of ideas offered per individual per personality type, IDEO-Inspired Technique

SESSION 3: Choice of Technique

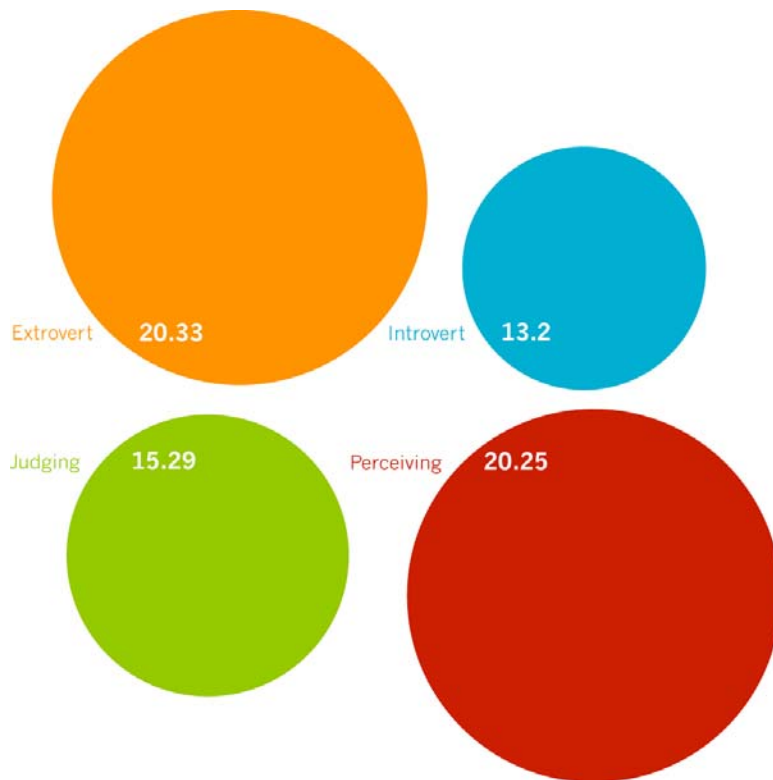


Figure 8. Average number of ideas offered per individual per personality type, Choice of technique

RESULTS: SATISFACTION

SESSION 1: Nominal Group Technique

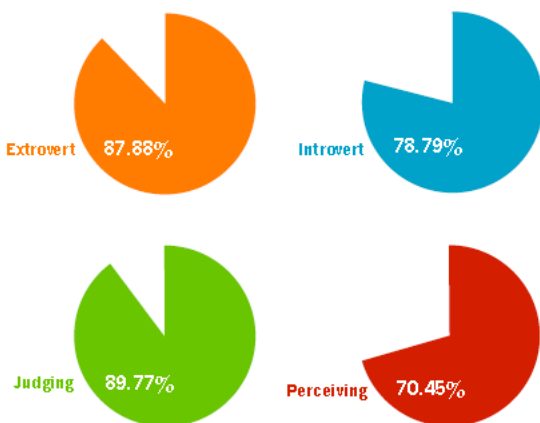


Figure 9. Percentage of participants (by personality type) that agreed or strongly agreed with satisfaction statements, Nominal Group Technique.

SESSION 2: IDEO-Inspired Technique

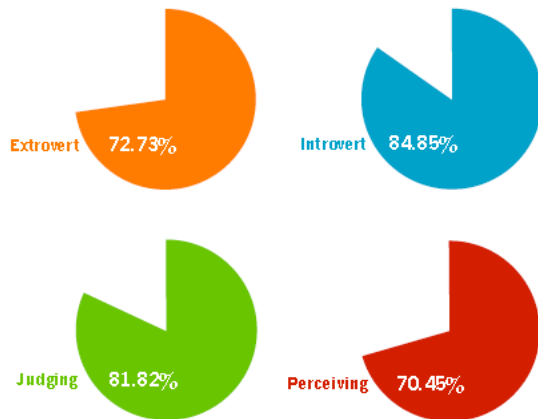


Figure 10. Percentage of participants (by personality type) that agreed or strongly agreed with satisfaction statements, IDEO-Inspired Technique.

SESSION 3: Choice of Technique

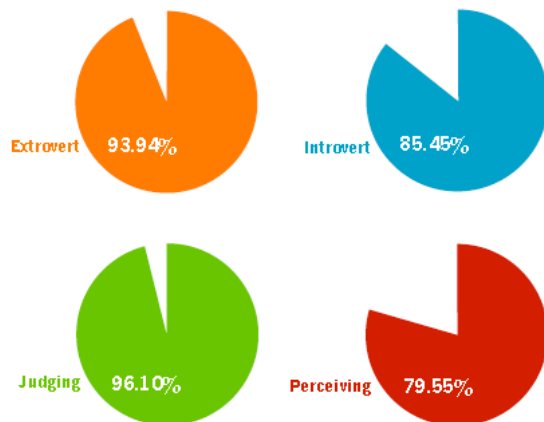


Figure 11. Percentage of participants (by personality type) that agreed or strongly agreed with satisfaction statements, Choice of Technique

inclination, a more loosely structured technique like the IDEO-Inspired may have allowed more time for Introverts to think and be introspective, which may have affected satisfaction. Thus, it seems that Introverts are more satisfied with a loosely structured technique like the IDEO-Inspired instead of the highly structured Nominal Group Technique (NGT). Also, despite the increase in involvement by Extroverts in session 2 (see Figure 7) when compared with session 1 (see Figure 6) their reported levels of satisfaction declined (see Figures 9, 10). Considering Extroverts are inclined to speak more than think, this is a surprising connection. This may be explained by a greater level of competition for involvement among other Extroverts in a loosely structured technique such as the IDEO-Inspired. This competition may have led to frustration and ultimately lower levels of reported satisfaction.

Satisfaction + Actionability

Highest levels of satisfaction were reported after session 3 (see Figure 11) by all personality types. The high levels of satisfaction could be attributed to group experience. By the third session the teams had greater levels of group brainstorming than before, and specifically had experience brainstorming specifically within their own group through the experience. Due to this experience, communication may have improved; comfort levels may have increased, all leading to greater levels of satisfaction. Also, the final session was more conversational. Teams talked through their ideas in more detail and focused in on ideas that were relative to their specific team interests, which also could have affected satisfaction.

Actionability, however, was at its highest in session 2 (see Figure 13). Therefore, it would seem that brainstorming techniques that generate the highest levels of actionable ideas are not the techniques that generate the highest levels of satisfaction. It is important to note, however, that number and percentage of actionable ideas from session three may have been affected by the conversational aspect of the session. Teams spent more time talking about ideas than generating them when compared with session 2 (see figures 7, 8).

Involvement + Actionability

Perhaps the most interesting results showed that when involvement was *maximized* meaning was shared most equally among all personality types in session 1 (see Figure 6) actionability was at it lowest (see Figure 12). An assumption at the start of the study was that maximum involvement (defined by maximum participation per individual) would positively affect number of actionable ideas. Surprisingly, the data show the opposite results for this study. This could be an indication that techniques that produce the highest levels of actionable ideas, like the IDEO-Inspired Technique in this case, might allow for more natural role-playing of personality types through a loosely structured technique. The low number of actionable ideas from session 1 (see Figure 12), however, might be explained by the inexperience of the group. Some participants had never brainstormed in a group setting before, and none and brainstormed as a group together. The first session may have served as a “warm up” where comfort levels and ideas may have flowed more easily in subsequent sessions because of this experience component.

FUTURE RESEARCH

Because this study is the first of its kind in connecting brainstorming performance and MBTI types and offering a new, 3-part maximum performance model, the opportunities for future research are immense.

An analogous study, using the established 3-part maximum performance model, could be conducted in industry across many product design consultancies or within one larger consultancy. A study like this would offer a greater number of participants to help support or dispute findings in this study. Also, a study with a larger scope might allow for more detailed analysis in regards to the role of MBTI in brainstorming performance. There are 4 preference areas within the MBTI, this study only considered the effects of two preferences pairs (Extrovert/Introvert, Judging/Perceiving). By extending a similar study into the realm of professional practice, comparisons between academia and industry would be possible. This data could be particularly helpful to help grow program like INNOVATIONSPACE. Additionally,

the results could help start a conversation between universities and design firms about how they might work more closely to develop design leaders.

Increasing the scale of this study, in number of teams, not size of teams, is another possibility for further exploration. It is important that the scaling would focus on the increased number of teams, however, instead of team size. Established research has investigated optimal team size and this should be referenced while establishing research strategy for such a study. Results from this study also show that additional obstacles were present in larger group brainstorming sessions such as management of ideas, facilitation and keeping the interest of all participants. A possibility for increasing the scale could be pursuing a longitudinal study that investigated brainstorming performance of INNOVATIONSPACE teams across several years. The findings of those studies, in combination with those of this study, could help illustrate more significant figures to support or dispute the viability of the 3-part performance model introduced.

Actionability is an integral part of the performance model, and future studies could explore the actionability of ideas generated from ideation (brainstorming) through implementation (see Figure 1). The study could focus on the *life of an idea* and investigate how the big ideas make it to the implementation phase of New Product Development. After all, the ultimate test of actionability is making it all the way into implementation. It would be interesting to track the implemented ideas back to brainstorming sessions and see how results might change in regard to technique, satisfaction, involvement and personality types involved during those sessions. Also, the implemented ideas could also be analyzed for any similarity among each other. Are they hybrids or products of idea synthesis? This exploration of the end product (actionable idea into implementation) could help understand how to produce more of them in future brainstorming sessions.

Actionability could also be connected to MBTI type. For example, ideas identified as actionable could be traced back to personality types to understand any trends or connections between the two. This would require a greater level of coding in observation, as each idea would have to be scribed and assigned to a particular participant, ultimately their personality type. The pairing of these variables could have

implications for future group brainstorming sessions. For example, the results could help inform how to select personality types to include in future sessions when trying to attain certain levels of actionability.

Considering the high level of satisfaction in the third and final session of this study, a future study could focus more on satisfaction alone in group brainstorming. The positive affect that is often experienced at the end of group brainstorming sessions could be an important part of team building. A future study could ask questions about the role of *fun* and *play* and *trust*. Questions about those elements could be asked incrementally, as a group brainstorms together and their experience in teams brainstorms progresses.

Facilitation is regarded as an essential element to successful brainstorms. Professional facilitation is a fruitful profession, one called upon by leading companies for a vast array of industries. Considering this, a future study could use the 3-part maximum performance model while studying a control group, brainstorming with an inexperienced facilitator and another led by a professional facilitator. The results could establish recommendations for future group brainstorming studies among academic and professional product design teams. Also, this study could help connect professional facilitators with the academic community offering an opportunity for both to learn more about each other. Hence, academia could better understand how to implement successfully facilitated brainstorming sessions and the professionals could broaden their experience into an academic setting.

Results of this study showed that involvement, overall, was not an indicator of actionability. Although involvement is an important element (without it, there are no ideas), satisfaction and actionability rose to the top as key players in the 3-part performance model. Looking at involvement through the perspective of MBTI personality types, it seems that less structured brainstorming sessions allowed for the natural tendencies of personalities to reign. Introverts participated less, but were more satisfied while Extroverts experienced more and were also more satisfied. This is an important discovery. This study started with the hypothesis that maximum involvement from all participants would positively affect actionability. It turns out, however, that allowing individuals to offer ideas within their level of comfort or preference yields greater results. In response to that, a future study could suggest a 2-part

performance model considering only satisfaction and actionability. This study could look for a more influential third element in terms of brainstorming performance, making a new model available for further study.

CONCLUSION

Connecting MBTI and brainstorming performance through this study is a first step in understanding what kind of role personality type plays in a NPD brainstorming process. This study is also unique because it incorporated three elements of a new performance model: involvement, satisfaction and actionability. The results can begin to inform future brainstorming helping understand additional consequences of the activity through satisfaction, investigate the role of involvement in terms of personality type and ultimately study the element connecting brainstorming to next steps in the process through actionability. Because the connections in this study and the new model proposed is the first of their kind, great possibility for future research remains.

Additionally, the results of this study ask for future research to look more closely at the components of the brainstorming experience. This is especially important considering the previous focus on performance measured by numbers of ideas. It's not just about ideas; many other consequences of group brainstorming that are worthy of further investigation.

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