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Improving Satisfaction: The Importance of Ownership of the Topic under the Group Brainstorming Technique

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Abstract

Designers always start to make ideation through brainstorming technique. Experience of satisfaction would determine the successful of the group performance. This study attempts to explain how personality traits influence satisfaction through the sense of ownership. Results showed that ownership of the topic mediates the relationships between the three personality traits, agreeableness, conscientiousness and emotional stability and Satisfaction. Groups that are high on these three personality traits would have high level of ownership on the topic given, subsequently, this high interest on the ideation process during the technique of brainstorming enhance their satisfaction to create new ideas.

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Keywords: Brainstorming; personality traits; ownership of the topic and satisfaction; industrial design

1. Introduction

The nature of the job of industrial designers is to deal with products that are to be used every day by consumers such as toothbrushes, computers, chairs and car models (Hannah, 2004). Industrial design is the area that gives its services in terms of creating and developing the concept to both users and

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manufacturers in order that the design is able to function, is valuable, and has desirable appearance of product and subsequently, beneficial to the users (IDSA, 2008). The term ‘industrial design’ that is used interchangeably with ‘product design’ involves both engineering and aesthetic design (Ekberg, 2005) but with more emphasis on users’ consideration (Roozenburg & Eekels, 1995). Furthermore, industrial design is linked to the manufacturing sector, the needs of consumers, and also takes into account business matters (Keinonen, 2006). However, industrial design firms face the problem when the products that they produce are not feasible (Michalek, Feinberg & Papalambros, 2005). This shows that the role of industrial designers is to solve people’s problems (Naveiro & Pereira, 2008).

Hence, in industrial design practices, creativity is needed and it plays an important role to come up with ideas and solutions. The importance of creativity cannot be denied because if anyone wants to be successful in his life, he should be creative (Sternberg & Lubart, 2003). Usually, the novelty of products such as new in idea and tangible is always involved in its creativity (Schunn, Paulus, Cagan, & Wood, 2006). Creativity can be enhanced through training such as brainstorming and creative problem solving (Nickerson, 2003).

However in group creativity, the unique rules of brainstorming as introduced by Osborn (1963) are: quantity is wanted, no criticism, the wildest ideas are welcome, and combine and improve ideas. In this case, personality traits are one of the diversities that should be explored in group creativity (Milliken, Bartel, & Kurtzberg, 2003). Recently, Paulus and Brown (2007) mentioned that to be more knowledgeable about this technique, integration between the discipline of brainstorming and other disciplines is needed. Expanding on group performance in industrial design practices, personality can lead to a better performance (Keinonen, 2006). This is because personality traits of group members would always predict the group performance (Peslak, 2006). For example, the team members who are talkative can stimulate the other members who are not (Keinonen, 2006).

2. Group Performance

2.1. Personality Traits and Group Performance

Feist (2003) in his discussion on personality and creativity provided the simple understanding that indeed, personality and creativity are always related. In group performance, Furnham and Yazdanpanahi (1995) revealed that the study of personality should be considered because personality traits have an impact on productivity in group creativity. In addition, researchers on personality and group performance such as Barry and Stewart (1997), Peeters, Rutte, Van Tuijl, and Reymen (2006), and Halfhill, Sundstrom, Lahner, Calderone, and Nielsen (2005) said that the personality factor always influences group performance. It was also proven by Unsworth, Brown, and McGuire (2000) that personality traits always influence employees’ innovation either directly or indirectly. Meanwhile in group tasks, researchers such as Driskell, Hogan, and Salas (1987), Barry and Stewart (1997), and Halfhill et al. (2005) also agreed that personality traits always influence the group creativity. Hence, nowadays, organizations prefer to choose employees that possess the personality trait of being a team worker, as a mechanism to accomplish the work (Buchanan, 1998; Halfhill et al., 2005).

2.2. Satisfaction in Group Performance

Halfhill et al. (2005) determine that group effectiveness is derived from the elements of success such as the Satisfaction of group members when they are in a group. This includes the group members’ experience and ability to work together on subsequent group tasks. In order to encourage persistence and productivity in group brainstorming, group satisfaction has to be taken into account. Satisfaction in group

process is important to determine because it leads to good performance (Peeters et al., 2006). The studies on Satisfaction and group brainstorming performance have been established by some researchers such as Rietzschel et al. (2006), Nijstad et al. (2004), and Nijstad et al. (2006). Reinig (2003) classified Satisfaction into two categories. First is Satisfaction with the process and the second one is Satisfaction with the outcomes. In this case, Satisfaction with the process is preferable because it leads to the later group performance on the brainstorming technique (Dennis et al., 1996; Gallupe, Dennis, Cooper, Valacich, Bastianutti, & Nunamaker, 1992; Rietzschel et al., 2006).

2.3. Ownership of the Topic and Group Performance

There are certain external factors that could also influence the group brainstorming performance. Researchers should consider this issue in their study (Isaksen, 1998). One of these factors is Ownership of the Topic. Ownership of the Topic occurs when the topic or problem that is given in the brainstorming session relates to the subjects' interest (Paulus & Brown, 2003). According to Isaksen (1998), Ownership of the Topic exists when the participants in brainstorming clearly feel that they have meaningful outcomes. Subsequently, the subjects will use all their abilities to produce creative ideas. The subjects feel that the topic belongs to them. Hence, the result of brainstorming has an impact and leads to meaningful implementation. The topics used in brainstorming research previously are quite general, such as 'the thumbs problem', in which the question is 'what would be the advantages and disadvantages of having an extra thumb on each hand?' (Bolin, 2002; Camacho & Paulus, 1995; Gallupe et al., 1991; Paulus et al., 1993), and role play about school and education (Coskun, 2005; Nijstad et al., 2004). Recently, a few researchers like Nijstad et al. (2006) and Barki and Pinsonneault (2001) have been focusing on the Ownership of the Topic given in the brainstorming study. For example, participants in brainstorming sessions felt that they would be more apprehensive if they were given a sensitive topic like AIDS or Violence compared to the usual topics such as parking or tourism (Barki & Pinsonneault, 2001). In addition, the topic should be parallel with the subjects' interests in brainstorming, so that participants could be more energetic to contribute creative ideas.

3. Problem Statement

The influence of personality traits such Agreeableness, Conscientiousness, Extraversion, Emotional Stability, and Openness on group performance has been well established (e.g. Burke & Witt, 2002; Halfhill et al., 2005). As mentioned earlier, the topics of brainstorming also play an important role in brainstorming study. As suggested by Isaksen (1998), researchers in brainstorming should pay attention to the topic given to the participants in the study on brainstorming sessions. Subsequently, participants in the study would be more responsive to the kinds of tasks and problems given to them if they felt a sense of ownership. Isaksen also suggests that future research should focus more on topic ownership because in a brainstorming session, the task or topic given is creative task. Ownership of the Topic could act as a mediator to explain the relationships among determinants and outcomes. It is essential to understand to what extent Ownership of the Topic can change, when the group of Industrial Design undergraduates has different types of personality traits, which in turn increase the group brainstorming performance. The potential of Ownership of the Topic as a mediating role to explain the relationship between personality traits and Satisfaction in group brainstorming performance has yet to be tested. A clear gap in scholarly literature illustrates this point to be studied empirically. The integration of personality traits, Ownership of the Topic and dimension of Satisfaction to explain brainstorming performance also remains unclear. Specifically in industrial design practices it is important to answer the following research questions:

- Are Personality Traits (Agreeableness, Conscientiousness, Extraversion, Emotional Stability, and Openness) and Ownership of the Topic related to Satisfaction?
- Does Ownership of the Topic mediate the relationship between personality traits and Satisfaction?

Based on the discussion above, we also developed the following hypotheses:

- H1a: Agreeableness is positively related to Satisfaction
- H1b: Conscientiousness is positively related to Satisfaction
- H1c: Extraversion is positively related to Satisfaction
- H1d: Emotional Stability is positively related to Satisfaction
- H1e: Openness is positively related to Satisfaction
- H2a: Ownership of the Topic mediates the relationship between Agreeableness and the Satisfaction
- H2b: Ownership of the Topic mediates the relationship between Conscientiousness and the Satisfaction
- H2c: Ownership of the Topic mediates the relationship between Extraversion and the Satisfaction
- H2d: Ownership of the Topic mediates the relationship between Emotional Stability and the Satisfaction
- H2e: Ownership of the Topic mediates the relationship between Openness and the Satisfaction

4. Methodology

4.1. Measures

4.1.1. BFI: Big Five Inventory

- (BFI) is used to measure five major domains of personality traits: Conscientiousness, Agreeableness, Emotional Stability, Extraversion, and Openness. Items consist of 5-point Likert scale ranged from ‘Disagree strongly’ to ‘Agree strongly’. Conscientiousness had an item such as “can be somewhat careless” and is a reliable worker”. While, Agreeableness had an item such as “is helpful and unselfish with others” and “is generally trusting”. Extraversion had an item such as “is talkative”, “is fully of energy”, and “generates a lot of enthusiasm”. Emotional Stability included items such as “is relaxed, handles stress well”, and “is emotionally stable, not easily upset”. Finally, Openness had an item such as “is original, comes up with new ideas”, “is curious about many different things”, and “is ingenious, a deep thinker”.

4.1.2. Ownership of the Topic:

- Since this variable is considered new in this area of study, *Ownership of the Topic* has been developed by the authors. These items were measured based on five-point Likert scale that range from “strongly disagree” to “strongly agree”. *Ownership of the Topic* included items such as “The problem in the brainstorming should suit with my area”, “I feel that the brainstorming problem was related with my field”, and “If such problem is going to be held in the future, I will be willing to participate”.
- Before the items were tried out in the pilot test, the content validity has been checked by three experts. Scrutinizing content validity at the first stage is known as face validity (Kaplan & Saccuzzo, 2001; Gregory, 2007). The experts were asked to comment on the clarity of items in the instrument of *Ownership of the Topic* and to offer suggestions to make those items clear. Based on the feedback received from the experts, appropriate changes were made to some items in the instrument.

4.1.3. Satisfaction:

- This instrument is used to measure Satisfaction (Dennis et al., 1996). Originally, this instrument contained 2 items that have been developed by Gallupe et al. (1992). Originally these items were: ‘were you satisfied with the process used?’ and ‘would you advocate this process to generate ideas?’

The reliability reported by Gallupe et al. (1992) was also high (Cronbach's alpha = .79). Dennis and Valacich (1993) reconstructed again the measure of *Satisfaction* developed by Gallupe et al. (1992). In their study in 1993, Dennis and Valacich (1993) reported that the reliability of three items was high, Cronbach's alpha = .88.

- Finally, Dennis et al. (1996) reported that the alpha value of measure of *Satisfaction* was = .82. In order to be balanced with the other instruments in terms of number of items, the researcher combined the instruments that had been developed by Gallupe et al. (1992) and Dennis and Valacich (1993). Altogether, there were 5 items to measure Satisfaction in this study. These items were measured based on seven-point scale that ranged from "very dissatisfied" to "very satisfied". These five items have also undergone the procedure of translation and back translation technique.

4.2. Sample and Population

Overall, there are 20 public universities in Malaysia. Of the 20 universities, there are only six universities that offer the Bachelor programme related to Industrial Design. Based on six public universities in this study, stratified random sampling was used to choose the subjects. Stratified random sampling is a good strategy to determine the subjects in the study. Most literature used four-person group in their study. Preceding researchers such as Jablin (1981), Harkins and Jackson (1985), Bolin and Neuman (2006), and Camacho and Paulus (1995) used four persons in each group. The procedure to collect the result of brainstorming session is explained below: (1) Participants were gathered in the hall to be given the briefing and instruction of the study (hypothesis of study was not given), (2) participants filled-up the instrument of *Big Five Inventory* (BFI), (3) the researcher delivered the lecture of brainstorming, (4) 4-persons in each group were formed by using simple random technique, (5) the warm-up topic was given to be brainstormed for 5 minutes. After that the instruction of rules of brainstorming and the actual topic was given: '*Malaysian furniture industries have grown and marked excellent sales in local and overseas market. However, lately the traditional business in rattan furniture becomes obsolete. As a future Industrial Designers, how do you want to make rattan as a useful and marketable product?*' (6) Brainstorming session (20 min.), (7) participants filled-up the instrument of Satisfaction and Ownership of the Topic, and (8) lastly; the researcher thanked all the participants, and dismissed the session.

5. Results

We used *Partial Least Squares* (PLS) to perform analysis. PLS is a second generation multivariate technique in data analysis (Haenlein & Kaplan, 2004). Using SEM with PLS needs us to perform two major steps: (1) assessing the measurement model in order to examine both convergent and discriminant validity and (2) assessing the structural model in order to examine the path coefficient (Hulland, 1999). Data was analysed by *SmartPLS 2.0 (M3) Beta* (Ringle, Wende, & Will; 2005).

5.1. Assessing the Measurement Model

Standardized loading for convergent validity that is recommended in measurement model is .70 (Chin, 1998). Nevertheless, loading of .50 and .60 are still acceptable when the indicators within the same block or construct have high loadings (Chin, 1998). The loading of .50 and .60 are also still acceptable when the construct is the new construct and the model is still new (Imam Ghozali, 2006). In this study, we applied loading of .60 after taking into consideration that modeling using PLS is still new in personality traits and group performance research. All items show the loading exceeds .60. Appendix A shows the

crossloadings within the same construct and the other constructs. In PLS, discriminant validity is assessed by three criteria: (1) factor loadings for all items should be .60 and above (2) composite reliability should be .70 and above, and (3) Average Variance Extracted (AVE) must show the cut-off .50 indicating at least 50% of the measurement variance (Fornell & Larcker, 1981). Table 1 shows that the composite for constructs are greater than .70. The table also shows the value of Cronbach's alpha for all constructs. The results from the table indicate that all construct have satisfactorily measured.. Table 1 also shows the Average Variance Extracted (AVE) for all constructs. Generally, we conclude that the AVE value for all constructs exceed .50. Hence, all the criteria as explained by Fornell and Larcker (1981) are met.

Table 1. Composite reliability, cronbachs alpha and ave

	Composite Reliability	Cronbachs Alpha	AVE
agree	0.78	0.58	0.54
cons	0.84	0.78	0.48
es	0.80	0.64	0.58
ext	0.81	0.69	0.52
op	0.85	0.78	0.52
own	0.94	0.93	0.53
satis	0.88	0.84	0.60

Note:agree=Agreeableness, con=Conscientiousness, ext=Extraversion, es=Emotional Stability, op=Openness, own=Ownership of the Topic, satis=Satisfaction

Finally, In the case of discriminant validity, Appendix A also reflects the loadings of items on their own constructs. It shows that the loadings of all constructs within the same construct (indicated by **Bold**) are expected to be high on this construct, thus indicating high convergent validity. Meanwhile, low value loading on the other constructs indicates high discriminant validity. Appendix A gives a clear convergent and discriminant validity for all constructs. All items in their respective construct show higher loadings than the other constructs.

5.2. Assessing Structural Model

In order to determine the statistical significance of the parameter estimates, a bootstrapping procedure with replacement using 500 sub-samples was used in this study. A bootstrapping has been used for two purposes: (1) to eliminate the assumption of normality and (2) recommended to the combination of mediation and moderation model (Edward & Lambert, 2007). Since all hypotheses are directional, this study used one-tailed t-test. This means that 90% level of confidence or $p < .10$ level of significant need t-value >1.283 , 95% level of confidence or $p < .05$ level of significant need t-value >1.648 , 99% level of confidence or $p < .01$ level of significant need t-value >2.334 , and 99.9% level of confidence or $p < .001$ level of significant need t-value >3.107 .

Table 2. Result of hypotheses

Hypothesis	β	Standard Deviation (STDEV) for path coefficient	T-statistics
Agreeableness -> Satisfaction	.17	0.05	4.05
Conscientiousness -> Satisfaction	.01	0.05	1.96
Extraversion -> Satisfaction	.02	0.05	0.62
Emotional Stability -> Satisfaction	.04	0.05	0.52
Openness -> Satisfaction	.60	0.05	1.33
Agreeableness -> Ownership of the Topic	.10	0.05	1.95
Conscientiousness -> Ownership of the Topic	.01	0.05	1.80
Extraversion -> Ownership of the Topic	.04	0.05	0.73
Emotional Stability -> Ownership of the Topic	.20	0.06	2.61
Openness -> Ownership of the Topic	.04	0.06	0.70
Ownership of the Topic -> Satisfaction	.33	0.04	7.76

Full and partial mediation was assessed when the following condition are met: First, full mediation exists when a path from the independent variable to mediator and from mediator to dependent variable is significant. However, path from independent variable to dependent variable is not significant. Second, partial mediation exists when a path from independent variable to dependent variable and paths from the independent variable to mediator and from mediator to dependent variable are all significant. Table 2 shows the result of the hypotheses and Table 3 shows the summary of findings.

Table 3. Summary of hypotheses

	Hypothesis	Hypothesized Effect	Supported
H1a	Agreeableness -> Satisfaction	+	Yes
H1b	Conscientiousness -> Satisfaction	+	Yes
H1c	Extraversion -> Satisfaction	+	No
H1d	Emotional Stability -> Satisfaction	+	No
H1e	Openness -> Satisfaction	+	Yes
H2a	Agreeableness->Ownership of the Topic -> Satisfaction	Mediation effect	Yes
H2b	Conscientiousness ->Ownership of the Topic -> Satisfaction	Mediation effect	Yes
H2c	Extraversion ->Ownership of the Topic -> Satisfaction	Mediation effect	No
H2d	Emotional Stability ->Ownership of the Topic -> Satisfaction	Mediation effect	Yes
H2e	Openness ->Ownership of the Topic -> Satisfaction	Mediation effect	No

5.3. Results of Hypotheses

Results revealed that personality of Agreeableness was positively related to Satisfaction ($\beta = 0.17, p < .001$). Results also revealed that personality of Conscientiousness was positively related to Satisfaction ($\beta = 0.01, p < .05$). However, Extraversion was not positively related to Satisfaction ($\beta = 0.02, p > .10$). Result also showed that Emotional Stability was not positively related to Satisfaction ($\beta = 0.04, p > .10$). In the case of Openness, result revealed that personality of Openness was positively related to Satisfaction ($\beta = 0.60, p < .10$). This result indicated that H1a, H1b, and H1e were supported. In the case of mediation analysis results show that partial mediation is occurring for the relationship between Agreeableness, Conscientiousness and Satisfaction, mediated by Ownership of the Topic, supported H2a and H2b, while full mediation is occurring for the relationship between Emotional Stability and Satisfaction, mediated by Ownership of the Topic, and also supported H2d.

6. Discussion

Group with high personality of Agreeableness, Conscientiousness, Extraversion, Emotional Stability, and Openness would increase the level of Satisfaction in brainstorming activity. Results mostly demonstrated that there are positive relationships between personality traits and Satisfaction. These findings are consistent as predicted previously. Halfhill et al. (2005) and Reinig (2003) stated that group effectiveness is derived from the elements of success such as the Satisfaction of group members when they are in a group which includes the group members' experience and ability to work together on subsequent group tasks. Parallel with Nijstad et al. (2006) who emphasized that group Satisfaction has to be taken into account in group performance. Therefore, the studies on Satisfaction and group brainstorming performance have been established by some researchers such as Rietzschel et al. (2006), Nijstad et al. (2004), Stroebe et al. (1992), Nijstad et al. (2006), and Paulus et al. (1993). Overall, Industrial Design undergraduates in the group may also increase Satisfaction.

This study also found that Ownership of the Topic is positively related to Satisfaction. According to Paulus and Brown (2007), people who have knowledge in their area would contribute the ideas even though they are less motivated in brainstorming session. This result supported prior finding by Rietzschel et al. (2006), Nijstad et al. (2004), Stroebe et al. (1992), Nijstad et al. (2006), and Reinig (2003). In the other words, when they owned the topic that is given, they would contribute more ideas. Results revealed that Ownership of the Topic positively related to group brainstorming performance. This result clearly indicates that all participants in this study own the topic that is given in brainstorming session.

Hence, result of this study emphasized the importance of personality traits factor that influence ownership of the topic given in brainstorming as revealed before by Peeters et al. (2006), and Halfhill et al. (2005) and finally Ownership of the Topic influences Satisfaction as suggested by Isaksen (1998). Studies by Nijstad et al. (2006) identified that participants who are familiar with the topic would contribute more ideas compared to the participants who are not familiar with the topic or difficult topic. This result also supports the model of Semantic Networks and associative Memory (Paulus & Brown, 2003), when participants are familiar and they are in the area of interest they would contribute more ideas. This study attempts to examine the mediation effect of Ownership of the Topic on the relationship between personality traits and Satisfaction. This study clearly reveals that groups that are not selfish, particular in certain cases, talkative, and emotionally stable in creative activities would own the topic given subsequently; increase Satisfaction in the brainstorming session.

Based on our study, there are several contributions to the group performance research literature especially in the industrial design practices. First, the development of the model in this study that takes into account of both direct and indirect effect of variables of personality traits, Satisfaction, and

Ownership of the Topic on group brainstorming performance. Second, this result is consistent with the finding by Barki and Pinsonneault (2001) and Nijstad et al. (2006) in term of Ownership of the Topic. The positive correlation between Ownership of the Topic and Quantity of Ideas for current sample is similar to the findings from previous research that was establish that, the topic that participants own would produce better performance (Paulus & Brown, 2003). Expanding to the case of variable of Ownership of the Topic, the result also suggest that in order to enhance the group brainstorming performance, the topic that parallel with the participants' interests should be considered.

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References

- Barki, H. & Pinsonneault, A. (2001). Small group brainstorming and idea quality: Is electronic brainstorming the most effective approach. *Small Group Research*, 32, 158-205.
- Barry, B. & Stewart, G.L. (1997). Composition, process, and performance in self managed groups: The role of personality. *Journal of Applied Psychology*, 82, 62-78.
- Bolin, A.U., (2002). *The relationships among personality, process, and performance in interactive brainstorming groups*. Unpublished PhD. Dissertation, Northern Illinois University.
- Bolin, A.U. & Neuman, G.A. (2006). The relationships among personality, process, and performance in interactive brainstorming groups. *Journal of Business and Psychology*, 20, 565-585.
- Buchanan, L.B. (1998). *The impact of big five personality characteristics on group cohesion and creative task performance*. Unpublished PhD. Dissertation, Virginia Polytechnic Institute and State University.
- Camacho, L.M. & Paulus, P.B. (1995). The role of social anxiousness in group brainstorming. *Journal of Personality and Social Psychology*, 68, 1071-1080.
- Chin, W.W. (1998). The partial least squares approach for structural equation modeling. In G.A. Marcoulides (Ed.), *Modern Methods for Business Research*, 295-336, Mahwah, NJ: Lawrence Erlbaum.
- Coskun, H. (2005). The effects of social identity and role taking on productivity in individual brainstorming. *Turk Psikoloji Dergisi*, 20, 133-136.
- Dennis, A.R., & Valacich, J.S.(1993). Computer Brainstorms: More head are better than one. *Journal of Applied Psychology*, 78, 531-537.
- Dennis, A.R., Valacich, J.S, Connolly, T., & Wynne, B.A. (1996). Process structuring in electronic brainstorming. *Information Systems Research*, 7, 268-277.
- Driskell, J.E., Hogan, R., & Salas, E. (1987). Personality and group performance. In C. Hendrick (Ed.), *Review of Personality and Social Psychology* (pp. 91-112). Newbury Park, CA: Sage.
- Edwards, J.R. & Lambert, L.S. (2007). Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. *Psychological Methods*, 12, 1-22.
- Ekberg, K. (2005). *Design investment in small wood manufacturing companies problems and possibilities of using design expertise in product development*. Unpublished PhD. Dissertation, Lulea university of Technology.
- Feist, G.J. (2003). The influence of personality on artistic and scientific creativity. In P.B. Paulus and B.A. Nijstad (Eds.). *Group Creativity: Innovation through Collaboration* (pp. 273-296). New York: Oxford University Press.
- Fornell, C. & Larcker, D.F. (1981). Evaluating structural equation models with unobserved variables and measurement error. *Journal of Marketing Research*, 18, 39-50.
- Furnham, A. & Yazdanpanahi, T. (1995). Personality differences and groups versus individual brainstorming. *Personality Individual Differences*, 19, 73-80.
- Gallupe, R.B., Bastianutti, L.M., & Cooper, W.H. (1991). Unblocking Brainstorms. *Journal of Applied Psychology*, 76, 137-142.

- Gallupe, R.B., Dennis, A.R., Cooper, W.H., Valacich, J.S., Bastianutti, L.M., & Nunamaker Jr., J.F. (1992). Group size & electronic brainstorming. *Academy Of Management Journal*, 35, 350-369.
- Gregory, R.J. (2007). *Psychological Testing: History, principles, and applications* (5th Ed). New York: Pearson, Allyn & Bacon.
- Haenlein, M. & Kaplan, A.M. (2004). A beginner's guide to partial least squares analysis. *Understanding Statistics*, 3, 283-297.
- Halfhill, T., Sundstrom, E., Lahner, J., Calderone, W., & Nielsen, T.M. (2005). Group personality composition and group effectiveness: An integrative review of empirical research. *Small Group Research*, 36, 83-105.
- Hannah, B. (2004). *Becoming a Product Designer*. New Jersey: John Wiley & Sons, Inc.:
- Harkins, S.G. & Jackson, J.M. (1985). The role of evaluation in eliminating social loafing. *Personality and Social Psychology Bulletin*, 11, 457-465.
- Hulland, J. (1999). Use of Partial Least Squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal*, 20, 195-204.
- Industrial Design Society of America IDSA. (2008). *IDSA About ID Section*. Retrieved December 14, 2008 from <http://www.idsa.org/absolutenm/templates/?a=89&z=23>
- Imam Ghozali (2006). *Structural Equation Modeling. Metode Alternatif dengan Partial Least Square (PLS)*. Semarang: Badan Penerbit Universitas Diponegoro.
- Isaksen, S.G. (1998). *A review of brainstorming research: Six critical issues for enquiry (Monograph #302)*. Buffalo, NY: Creative Problem Solving Group-Buffalo.
- Jablin, F.M. (1981). Cultivating imagination. Factors that enhance and inhibit creativity in brainstorming group. *Human Communication Research*, 7, 245-258.
- Kaplan, R.M. & Saccuzzo, D.P. (2001). *Psychological Testing: Principles, Applications, and Issues* (5th Ed). Stamford: Wadworth, Thomson Learning.
- Keinonen, T. (2006). Introduction to concept design. In R. Takala and T. Keinonen (Eds.). *Product Concept Design: Review of Conceptual Design of Production in Industry* (pp. 2-31). Germany: Springer.
- Keinonen, T. (2006). The concept design team. In R. Takala and T. Keinonen (Eds.). *Product Concept Design: Review of Conceptual Design of Production in Industry* (pp. 34-56). Germany: Springer.
- Michalek, J.J., Feinberg, F.M., & Papalambros, P.Y. (2005). Linking marketing and engineering product design decisions via analytical target cascading. *Journal of Product Innovation Management*, 22, 42-62.
- Milliken, F.J., Bartel, C.A., & Kurtzberg, T.R. (2003). Diversity and creativity in work groups: A dynamic perspective on the affective and cognitive processes that link diversity and performance. In P.B. Paulus and B.A. Nijstad (Eds.). *Group Creativity: Innovation through Collaboration* (pp. 32-62). New York: Oxford University Press.
- Naveiro, R.M. & Pereira, R.c. (2008). Design education in Brazil. *Design Education*, 29, 304-312.
- Nickerson, R.S. (2003). Enhancing creativity. In R.J. Sternberg (Ed.). *Handbook of Creativity* (pp. 392-430). Cambridge: University Press.
- Nijstad, B.A., van Vianen, E.M., Stroebe, W., & Lodewijckx, H.F.M. (2004). Persistence in brainstorming. Exploring stop rules in same-sex group. *Group Process & Intergroup Relations*, 7, 195-206.
- Nijstad, B.A., Stroebe, W., & Lodewijckx, H.F.M. (2006). The illusion of group productivity: A reduction of failures explanation. *European Journal of Social Psychology*, 35, 31-48.
- Osborn A.F. (1963). *Applied Imagination: Principles and Procedures of Creative Problem Solving* (2nd Ed). New York: Scribner's.
- Paulus, P.B., Dzindolet, M.T., Poletes, G., & Camacho, L.M. (1993). Perception of performance in group brainstorming: The illusion of group productivity. *The Society for Personality and Social Psychology*, 19, 78-89.
- Paulus, P.B. & Brown, V.R. (2003). Enhancing ideational creativity in groups: lessons from research on brainstorming. in Paulus, P.B. and Nijstad, B.A. (eds.). *Group Creativity: Innovation Through Collaboration*, 110-136. New York: Oxford University Press.
- Paulus, P.B. & Brown, V.R. (2007). Toward more creative and innovative group idea generation: a cognitive-social-motivational perspective of brainstorming. *Social and Personality Psychology Compass*, 1, 248-265.
- Peeters, M.A.G., Rutte, C.G., Van Tuijl, H.F.J.M., & Reymen, I.M.M.J. (2006). The big five personality traits and individual satisfaction with the team. *Small Group Research*, 37, 187-211
- Peslak, A.R. (2006). *The Impact of Personality on Information Technology Team Projects*. Proceedings of the 2006 ACM SIGMIS CPR Conference on Computer Personnel Research.
- Reinig, B.A. (2003). Toward an understanding of satisfaction with the process and outcomes of teamwork. *Journal of Management Information Systems*, 19, 65-83.
- Rietzschel, E.F., Nijstad, B.A., & Stroebe, W. (2006). Productivity is not enough: A comparison of interactive and nominal brainstorming groups on idea generation and selection. *Journal of Experimental Social Psychology*, 42, 244-251.
- Ringle, C.M., Wende, S., & Will, S. (2005) SmartPLS 2.0 (M3) Beta, Hamburg 2005, <http://www.smartpls.de>.
- Roozenberg, N. & Eekels, J. (1995). *Product Design: Fundamentals and Methods*. UK: John Wiley and Sons Ltd.

- Schunn, C.D., Paulus, P.B., Cagan, J., & Wood, K. (2006). Final Report from the NSF Innovation and Discovery Workshop: The Scientific Basis of Individual and Team Innovation and Discovery. Retrieved February 3, 2010 from <http://www.nsf.gov/pubs/2007/nsf0725/nsf0725.pdf>
- Sternberg, R.J. & Lubart, T.I. (2003). The concept of creativity: Prospects and paradigms. In Sternberg, R.J. (Eds.). *Handbook of Creativity*, 3-15. Cambridge University Press.
- Stroebe, W., Diehl, M., & Abakoumkin, G. (1992). The illusion of group effectivity. *Personality and Social Psychology Bulletin*, 18, 643-650.
- Sutton, R.I., & Hargadon, A. (1996). Brainstorming in context: effectiveness in a product design firm. *Administrative Science Quarterly*, 41, 685-718.
- Unsworth, K.L., Brown, H., & McGuire, L. (2000). Employee innovation: the roles of idea generation and idea implementation. Paper presented at SIOP Conference, New Orleans, Louisiana, April 14-16, 2000.

Appendix A

A.1. Crossloadings

	agree	cons	es	ext	op	own	satis		agree	cons	es	ext	op	own	satis
agree 32	0.66	0.36	0.21	0.19	0.25	0.11	0.13	own 1	0.07	0.11	0.12	0.05	0.07	0.69	0.22
agree 42	0.77	0.30	0.18	0.25	0.18	0.19	0.23	own 10	0.14	0.14	0.18	0.09	0.12	0.63	0.25
agree 7	0.77	0.37	0.26	0.29	0.30	0.17	0.23	own 11	0.16	0.16	0.14	0.10	0.11	0.78	0.42
con 13	0.44	0.66	0.20	0.22	0.33	0.15	0.22	own 12	0.18	0.18	0.15	0.11	0.17	0.76	0.27
con 23	0.19	0.59	0.22	0.24	0.22	0.11	0.13	own 14	0.23	0.20	0.26	0.24	0.24	0.69	0.36
con 28	0.32	0.74	0.17	0.14	0.35	0.19	0.15	own 15	0.16	0.13	0.11	0.11	0.09	0.63	0.25
con 3	0.28	0.74	0.20	0.19	0.43	0.15	0.16	own 2	0.13	0.17	0.12	0.06	0.13	0.80	0.30
con 33	0.37	0.75	0.35	0.31	0.49	0.18	0.19	own 3	0.12	0.19	0.20	0.06	0.17	0.64	0.19
con 38	0.24	0.66	0.25	0.23	0.25	0.16	0.10	own 4	0.17	0.20	0.19	0.10	0.16	0.79	0.25
es 24	0.25	0.23	0.76	0.22	0.27	0.16	0.09	own 5	0.15	0.19	0.28	0.17	0.17	0.73	0.18
es 34	0.22	0.30	0.83	0.18	0.36	0.23	0.08	own 6	0.11	0.11	0.14	0.07	0.08	0.74	0.19
es 9	0.21	0.24	0.69	0.14	0.34	0.14	0.08	own 7	0.17	0.19	0.16	0.12	0.17	0.84	0.34
ext 11	0.34	0.41	0.34	0.65	0.42	0.12	0.12	own 8	0.19	0.15	0.18	0.12	0.14	0.77	0.25
ext 21	0.13	0.15	0.04	0.71	0.12	0.09	0.10	own 9	0.19	0.19	0.21	0.08	0.18	0.70	0.25
ext 36	0.28	0.20	0.17	0.73	0.25	0.13	0.10	satis 1	0.24	0.19	0.07	0.09	0.14	0.29	0.83
ext 6	0.18	0.11	0.08	0.78	0.15	0.10	0.12	satis 2	0.21	0.21	0.09	0.10	0.18	0.26	0.80
op 15	0.23	0.45	0.32	0.30	0.78	0.20	0.20	satis 3	0.17	0.17	0.10	0.09	0.19	0.26	0.80
op 20	0.19	0.27	0.31	0.24	0.65	0.06	0.13	satis 4	0.16	0.17	0.13	0.09	0.16	0.22	0.73
op 25	0.27	0.35	0.41	0.22	0.79	0.16	0.14	satis 5	0.28	0.18	0.06	0.19	0.09	0.39	0.72
op 40	0.30	0.40	0.21	0.24	0.66	0.10	0.07								
op 5	0.23	0.36	0.26	0.23	0.73	0.16	0.12								

Note: agree=Agreeableness, con=Conscientiousness, ext=Extraversion, es=Emotional Stability, op=Openness, own=Ownership of the Topic, satis=Satisfaction