

# THE EFFECTS OF ANONYMITY ON IDEA SELECTION AND REFINEMENT

A Thesis

by

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## Abstract

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As a result of outsourcing, today's organizations use electronic communication to produce innovative ideas and make decisions to keep up with the competition in the market. Past studies have underscored the importance of promoting creativity from idea generation through the implementation phase of innovation (Watts, Steele, Medeiros, & Mumford, 2019). Additionally, research reveals that anonymous groups can produce more original ideas than non-anonymous groups (McLeod, 2011). However, studies have not directly examined the effects of anonymity and the stages of innovation (idea generation, selection, and refinement) on various measures of creativity. The current study examines the role of anonymity and the stages of innovation in creative performance among computer-mediated groups. A sample of 92 undergraduate students from a midsized university participated in small groups of three to four individuals to complete a creativity task in either an anonymous or an identified condition. The study followed a 2 Anonymity (anonymous and identified) X 3 Stages of Innovation (brainstorming, idea selection, and idea refinement) mixed factorial design. Results revealed that the anonymous groups produced ideas of the highest average quality in the refinement phase of innovation. The results of this study enhanced our understanding of the productivity and creativity of groups in computer-mediated communication.

*Keywords: Creativity, Idea refinement, Decision-making, Anonymity*

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## **Introduction**

Group brainstorming has evolved into a creative experience to gather effective ideas to solve issues within organizations. Many studies have found that groups of participants working in isolation on the same problem (nominal) outperform the groups where participants share and exchange ideas (interactive) both in quantity as well as the quality of ideas generated (DeRosa, Smith, & Hantula, 2007; Diehl & Stroebe, 1987; Dornburg, Stevens, Hendrickson, & Davidson, 2009). However, organizations often nurture the assumption that interactive groups surpass nominal groups (Faure, 2004). Many studies have built a foundation on Osborn's (1953) report: the quantity of ideas will lead to quality ideas (Rietzschel, Nijstad, & Stroebe, 2010). However, several studies have found that the relationship between quantity and quality is not that simple (Johnson & D'Lauro, 2018; Rietzschel, Nijstad, & Stroebe, 2006; Watts, Steele, Medeiros, & Mumford, 2019). The generation of good quality ideas does not automatically result in the selection of good quality ideas unless the participants are provided with clear instructions (Rietzschel, Nijstad, & Stroebe, 2017). The selection of good quality ideas is not only important in the organizations, but the good quality ideas must be feasible and original (Baruah & Paulus, 2009; Johnson & D'Lauro, 2018; Rietzschel, et al., 2010). Implementation of the final solution to the problem is only possible after a thorough evaluation and refinement of the ideas generated and selected. The first objective of the current study is to examine the process of idea generation, selection, and evaluation (refinement), and the role of each stage on the overall quality (ideas high in both feasibility and originality) of the final ideas created.

## **Idea Selection**

Idea selection tends to play a crucial role in innovation. The motivation for selecting good quality ideas lacks in participants because they would rather rate ideas than select ideas (Watts, et al., 2019). There is a strong tendency to select feasible ideas over original ideas



(feasibility bias; Rietzschel, Nijstad, & Stroebe, 2017). Although the best ideas are often generated first, the selection of the ideas tends to be less original than feasible (Johnson & D’Lauro, 2018). Blair and Mumford (2007) reported that when individuals select ideas, they have to accept the responsibility of that idea. When ideas are selected, consequences follow the selection, and individuals are likely to weigh the consequences of the idea. As a result, individuals are likely to choose less risky ideas (ideas that are feasible and easy to implement). For organizations to benefit from ideas, they must make the best selection (Faure, 2004), where the ideas are original as well as feasible (Zhu, Ritter, Muller, & Dijksterhuis, 2017). Few studies have examined ways to improve the selected ideas to make them more creative and feasible. Strategies such as differentiating from a diverse pool of generated ideas are shown to improve the quality of selected ideas (Harvey & Kou, 2013). Rietzschel, Nijstad, and Stroebe (2014) found that participants selected more creative ideas when the task was performed under restrictions such as a narrow or broad problem topic. For example, the researchers asked participants to generate ideas over broad topics such as “possible improvements in the education at the department of psychology” or over narrow topics such as “possible improvements in the lectures at the department of psychology.”

In two other studies, Rietzschel et al. (2010) and Heller, Levin, and Goransson (2002) used an inclusion and exclusion strategy to examine which strategy participants preferred and whether these strategies improved the quality of selection. The researchers gave a list of ideas to the participants at the start of the study. With the inclusion strategy, participants circled ideas that they believed should be considered for further review. If the exclusion strategy is selected, participants cross out ideas that they believe should not be considered for further consideration. Heller et al. (2002) found that 80% of the participants used the exclusion strategy. The

participants who chose inclusion displayed higher motivation than those who displayed the exclusion strategy. When participants were faced with the choice of inclusion and exclusion, more participants chose inclusion when the task was related to personal judgment. More participants chose exclusion when the task was to choose the correct answer. However, Rietzchel et al. (2010) found that the inclusion and exclusion strategies did not improve the quality of the ideas selected. Rietzchel et al. (2010) measured the quality of an idea on a five-point scale in terms of feasibility and originality. They found that specific pre-selection instructions helped the participants in selecting good quality ideas.

Faure (2004) performed a study to evaluate the consequences of brainstorming on the stages of selection and implementation. Groups who are selecting from their own set of ideas selected ideas of higher average quality than when they were selecting from a set of ideas generated by another group. The average quality of an idea was calculated by averaging three by three raters on a five-point scale. Finally, one study found that training individuals to select original ideas can increase the likelihood of original ideas being selected (Blair & Mumford, 2007). The above studies primarily tested idea generation and selection. However, none of the studies above specifically instructed the participants to evaluate and refine the ideas to make them suitable for implementation. A thorough evaluation of the selected ideas to make them more suitable for implementation is the key in the process of creativity (Watts, et al., 2019).

### **Idea Evaluation (Refinement)**

In addition to idea selection, allotting some time for the evaluation of ideas is necessary to develop creative ideas. According to Blair and Mumford (2007) and Lonergan, Scott, and Mumford (2004), ideas can receive an appraisal in the idea evaluation stage. The amount of appraisal an idea receives can determine the acceptance or rejection of the idea at the selection

stage. Ideas are rejected or accepted when forecasting the success or failure of an idea which is done early (Lonergan et al., 2004; Watts et al., 2019). If ideas are accepted or rejected early, the ideas have a probability of type 1 or 2 errors occurring (Watts et al., 2019). Type 1 errors occur when poor ideas have an assumption to be successful ideas but result in failure. Type 2 errors occur when good ideas are believed to be poor ideas, so the ideas are disregarded.

Watts et al. (2019) conducted a study in which the individuals participated in one of the combined conditions: idea source, goals, and climate. In the idea source condition, participants were given either the reviewed or an initial list of ideas. These ideas contained three low-quality ideas, three medium quality ideas, and three high-quality ideas. In the goal condition, groups of participants were to promote a campaign where the campaign had to be high in quality (high in feasibility as well as originality). In the climate condition, participants were introduced to competitive conditions in which they would be rewarded if they produced ideas that were high in quality. Participants in the collaborative culture were informed that high-quality ideas would receive shared recognition. The refinement of ideas was performed in terms of the quantity of novel ideas, combinations of ideas, and elaboration. The selected ideas were evaluated on whether the ideas from the initial list was elaborated on in the final task. The results showed that participants generated more creative ideas in the collaborative climate when they were told to focus on originality. Watts et al. (2019) envisioned that the reason behind this result was that participants did not feel pressured to compete, which led to a secure zone to elaborate on creative ideas. All of the conditions were influenced by the instruction to focus on the inadequacy of their ideas. Participants were instructed to find any error that may occur with the production of the ideas and refine the ideas to make them better at a final stage called refinement (Watts et al., 2019). The researchers found that participants who had a pre-selected set of ideas produced more

original ideas in their final campaign than in the selection phase. In addition, the participants who were tasked with generating ideas combined more ideas in their final campaign from the set of ideas that were generated compared to participants who were tasked with selecting ideas from a pre-generated list of ideas. This study used a pre-generated list of ideas for the face to face group condition and reported the effectiveness of idea evaluation in a creative process. However, the study did not test idea selection and refinement in a computer-mediated communication paradigm (Watts et al., 2019).

Blair and Mumford (2007) performed a study in which idea evaluation was assessed under factors such as time pressure and group social pressure. In the study, the researchers gave the participants a scenario pertaining to a non-profit organization. The participants generated ideas that focused on new and common areas of the organization. After generating ideas, participants were instructed to select the ideas that were most beneficial to the organization. Finally, participants were asked to make “final recommendations for funding” the ideas. The results showed that ideas that displayed originality were not selected. Additionally, individuals had more assurance with ideas that were appealing to social norms. When the time to select the ideas were reduced, participants chose ideas that were risky or original. Furthermore, participants prefer ideas that benefited a greater quantity of individuals. The researchers suspected that training individuals to select original ideas could increase the likelihood of individuals selecting original ideas.

In sum, there have been very few studies on idea refinement. Although idea selection is an essential aspect of innovation, a thorough evaluation of the selected ideas to refine and make them more suitable for implementation is the key to innovation. However, findings are limited in terms of idea refinement. The current study predicts that allowing participants to evaluate and

refine the selected ideas to make them more original and feasible will result in ideas of higher quality and will eliminate the tendency of feasibility bias. The refinement stage will allow for a more in-depth search and elaborate within the ideas resulting in the generation of more novel ideas (Baruah & Paulus, 2011). It is yet to be known whether the addition of a refinement stage after the selection stage will result in ideas high in feasibility, originality, and “good quality” rating. A “good quality” idea is one that receives a rating of three and above in terms of both feasibility and originality in a five-point rating scale.

**H1:** The refinement phase will result in ideas of higher average originality, feasibility, and “good quality ideas” than the selection and the generation phase of innovation.

### **Anonymity**

An important factor that affects performance in a brainstorming task is anonymity. Anonymity is defined as a situation where a task is performed by groups of unidentified individuals or unnamed participants (McLeod, 1997).

Anonymity can carry various conditions or characteristics and is tested in different ways. McLeod (1997) identified a few types of conditions, such as social anonymity and perspective of anonymity. Social anonymity is the perception of anonymity through the amount of information exchanged through an individual for themselves and their peers (McLeod, 1997). Social anonymity focuses on whether the individuals believe that they are anonymous. The perspective of anonymity is an individual ability to associate information of other individuals in a group or the group members’ ability to associate information of each other (McLeod, 1997).

Anonymous conditions give individuals free will to generate ideas and ignore social norms (Cooper, Gallupe, Pollard, & Cadsby, 1998; McLeod, 1997). Lea, Spears, and de Groot (2001) tested the effects that visual anonymity had on participants. Visual anonymity allows

participants to distribute information without displaying an image of oneself (Lea et al., 2001). Lea et al. (2001) measured how visual anonymity affected deindividuation. Deindividuation is interpreted as a deprivation of an individual's self or self-consciousness within a group (Lea et al., 2001). They reported that visual anonymity reduced an individual's self-focus and increased the group focus. Individuals were more focused on improving characteristics within the group. Anonymity produces a deindividuating effect that allows groups to create ideas that would have been withheld otherwise. As a result, groups have an opportunity to participate in unconventional thinking by generating more controversial and non-redundant ideas (Cooper et al., 1998). The next section discusses deindividuation in the context of anonymity more in detail.

### **Theoretical Background of Anonymity**

The Social Identity Model of Deindividuation Effects (SIDE) model asserts that the identity of a person is accentuated in certain context. While placed in a group, people tend to accept the group identity rather than their individual identity. SIDE is defined as a perception of an individual in groups based on the characteristics and personal information of the individual (Huang & Li, 2016). The SIDE model is used to identify how anonymity features affect social groups (Huang & Li, 2016). The SIDE model consists of three components: anonymity, cognitive, and strategic. The cognitive component of the SIDE model suggests that individuals are likely to adapt to social norms if peer groups can interact with one another visually as well as physically (Pissarra & Jesuino, 2005). The strategic component utilizes favorable information about the group members to build acceptance within the group (Pissarra & Jesuino, 2005). The cognitive component of building social norms can be minimized by enforcing anonymous conditions such as withholding individuals' identity by conducting group interaction via computer communications (Pissarra & Jesuino, 2005). Anonymity can lack body language, which

could signal the acceptance of group members and social norms. In the innovation process, creative ideas are withheld in the absence of anonymity. Since social cues are absent in anonymous conditions, group members aim to establish social norms without identifying factors such as body language that focused on acceptable ideas (Haung & Li, 2016; Lee, 2007). Lea et al. (2001) suggested the SIDE model encourages a reduced self-awareness in which individuals are likely to divert the attention from self to group in anonymous conditions, which may come from the need to identify group members.

Anonymity may be helpful in situations where the performance in groups is affected due to factors such as evaluation apprehension and production blocking. Anonymity reduces the tendency of evaluation apprehension in groups (McLeod, 2011), which occurs when participants sense their ideas will receive an opposing opinion from a group member(s) (Diehl & Stroebe, 1987). Hence the fear of rejection results in low productivity (Diehl & Stroebe, 1987; Paulus & Brown, 2007). Thus, if evaluation apprehension is reduced, one risky idea can be produced, and that idea encourages other risky ideas to be generated (Pinsonneault, Barki, Gallupe, & Hoppen, 1999). Also, production blocking is another factor that can affect the outcome of brainstorming within groups, which occurs when group members are unable to communicate or verbalize their ideas immediately (Baruah, & Paulus, 2009; DeRosa et al., 2007; Diehl & Stroebe, 1987; Pinsonneault et al., 1999). With the introduction of anonymity in groups, the above factors can be controlled to a large extent. Anonymity can be more effective in the context of electronic brainstorming, where the participants generate and share ideas through computer-mediated communications. Because electronic brainstorming has fewer social cues such as body language, there is a reduction in production blocking and evaluation apprehension (DeRosa et al., 2007). Thus, previous studies have revealed positive effects of anonymity on idea generation (Cooper et

al., 1998; McLeod, 2011); however, no studies have tested the effects of anonymity condition in idea selection and refinement in the context of electronic brainstorming.

### **Anonymity in Electronic Brainstorming**

One of the common forms of virtual communication is electronic brainstorming. Electronic brainstorming (EBS) is a computer-based brainstorming session that is used to transmit ideas to group members (DeRosa et al., 2007). Previous research shows that EBS is expected to reduce production blocking as the ideas can be generated simultaneously on a computer screen and the participants do not have to wait for their turn to express ideas like face-to-face paradigm (Dennis, Minas, & Bhagwatwar, 2007; DeRosa et al., 2007). Participants can view ideas at any time on a computer screen without losing concentration. Evaluation apprehension is reduced as well in EBS. EBS can gather ideas from a group without a specific source of each idea through anonymity (Dugosh, Paulus, Roland, & Yang, 2000). Often in a group session, members may fear rejection of ideas (Pinsonneault et al., 1999), which may lead to withholding ideas. In an EBS paradigm, social cues such as body language are not visible (Dornburg, Stevens, Hendrickson, & Davidson, 2009); hence, the evaluation apprehension is likely to be reduced. Additionally, the feedback-seeking behavior that would typically be in a face to face interaction to recognize social norms (Stobbeleir, Ashford, & Buyens, 2011) is retained in the EBS context.

Electronic brainstorming groups have the option to be anonymous. Research shows that anonymity promotes effective evaluation of communication as the source is not attached to the ideas, especially in an anonymous electronic brainstorming paradigm (Dennis, Menace & Williams, 2019). Jong, Lai, Hsia, and Lin (2013) conducted a study in which the effects of anonymity were tested. Individuals were assigned to either a face-to-face or electronic



anonymity condition. The individuals were evaluated on the amount of contribution given in the group while discussing the correct answer. The results showed everyone contributed ideas in the anonymity condition while brainstorming. While brainstorming, not everyone contributed ideas in the face-to-face condition. In the anonymity condition, more individuals scored higher in learning achievement than the face to face condition. Thus, limitations such as evaluation apprehension were reduced with anonymous conditions. Individuals were more open to producing unique ideas if the individual acknowledges the condition will be anonymous (Cooper et al., 1998).

Chang (2011) conducted a study to test the effects of a structured anonymous setting. Rather than interacting with group members, individuals of a group interacted with the assigned leader of the group. There were two groups, and each group was given a set of different instructions. Four sessions were conducted to improve idea generation and selection. Group one was told to “think out of the box.” Group two was given specific instructions, such as in session two, the new ideas had to have a “level of abstraction.” During the first three sessions, members of the group received feedback summaries on how to improve the quality of their ideas in the idea generation task. In the final session, participants ranked the ideas in order from most novel to least novel. Chang (2011) found that the participants in the anonymous setting enjoyed the activity more than the non-anonymous setting.

When individuals were identified as having a higher learning achievement, those individuals were likely to become the “Centralized knowledge exchange” (Jong, et al., 2013), which means individuals gave all or most of the answers to an issue. Valacich, Dennis, and Nunamaker (1992) tested the effects of anonymity on group size. Anonymous conditions were shown to have more critical perspectives toward the generated ideas than identified conditions.

Furthermore, small (3-member groups) identified groups recognized themselves as being more productive when generating ideas compared to large (9-member) groups.

In sum, the studies above tested the anonymous condition in an EBS paradigm and reported improvement in the quality of ideas (e.g., Chang, 2011). However, Jong, et al. (2013) and Chang (2011) did not have a non-anonymous condition (as a baseline) to compare the increase in performance with respect to the anonymous condition. Moreover, Jong et al. (2013) did not have the participants select ideas. Additionally, none of the studies listed above had a refinement stage where the participants could evaluate their selected ideas to make them better in quality. Hence another objective of the current study is to examine the effects that anonymity has on idea quality within the selection and refinement stage of innovation. Due to the absence of social cues, reduced production blocking, and evaluation apprehension, the participants should perform better in the anonymous conditions, then the identified conditions in the EBS paradigm. Therefore, the current study predicts an interaction between anonymity and the stage of innovation. The creation of most ‘good quality ideas’ in the refinement stage of innovation will be magnified by the anonymity condition. The ideas will be magnified because the participants will have the opportunity to evaluate and refine the ideas at the refinement stage to make them original as well as feasible. The performance at the refinement stage will be best under the anonymous condition due to the increased focus of the task and reduced tendency of developing social norms (Haung & Li, 2016), evaluation apprehension and production blocking (Dennis et al., 2019). Due to enhanced focus on both feasibility and originality at the refinement stage, the feasibility bias that could have occurred at the selection stage would be minimized at the refinement stage. Thus, I predict the following:

**H2:** The anonymity condition will result in ideas of higher average originality, feasibility, and “good quality” than the identified condition.

**H3:** The ideas of the highest average originality, feasibility, and “good quality” in the refinement session will be enhanced by the anonymity condition.

In sum, participants will complete a task that has three stages of innovation. Within the idea generation stage, participants have the possibility of experiencing factors such as production blocking and evaluation apprehension. When participants experience these factors, they are likely to produce fewer ideas. The use of anonymity with computer-mediated communication is expected to decrease the likelihood of production blocking and evaluation apprehension because anonymity gives participants free will to generate unusual ideas without feeling as if they have violated social norms (Cooper, et al., 1998). Furthermore, while selecting ideas, the participants tend to select the feasible ideas more than the original ideas. To minimize feasibility bias, the participants will be completing an idea evaluation task to refine the selected ideas to make them both more original and feasible. Present knowledge indicates that no study has examined the effect that anonymity has on the stages of innovation in a computer-mediated communication setting.

## **Method**

### **Participants**

There was a sample size of 113 undergraduates from a mid-sized public university in Texas. The performance of 21 students were excluded from the study because of not correctly following instructions. With the exclusion of students, 92 participants were included in the current study. Students were recruited through classrooms with permission from instructors. The inclusion criteria were:

- 1) Participants of the age 18 or above
- 2) Undergraduate students currently enrolled at the university.

There were 30 groups with three or four participants in each group. Fifteen groups (47 participants) were assigned to the anonymous condition. Fifteen groups (45 participants) were assigned to the identified condition. The participants were randomly assigned to 1 of the 30 groups. All groups performed a task under each of the three phases of innovation: idea generation, selection, and refinement.

### **Design**

The design was a 2 anonymity (anonymous and identified) X 3 stages of innovation (brainstorming, idea selection, and idea refinement) mixed factorial design (see Appendix A). Stages of Innovation was a repeated measure factor, and the anonymity condition was an independent group factor.

### **Measures**

The dependent measures for this study were originality, feasibility, and good quality ideas. Originality was defined as ideas that were novel or unique (Rietzschel, et al., 2010). Feasibility was defined as ideas that were convenient or easy to implement (Rietzschel, et al.,

2010). Good quality ideas were ideas that received a score of 3 or above both in feasibility and originality in a five-point Likert scale as rated by trained raters using the above definitions of each measure (Blair & Mumford, 2007).

Three trained raters rated each idea for feasibility and originality on a five-point scale with 1 being the least original (feasible) and 5 being the most original (feasible) idea. Finally, the extent to which an idea is good quality was measured using the five-point Likert scale. An idea must have a score of 3 points or higher on both original and feasible scales to be considered a good quality idea (Diehl & Stroebe, 1987). Three trained raters rated all the ideas. The raters were considered in agreement when the rating was the same on the five-point Likert scale or when the rating had a difference of no more than one point (Baruah & Paulus, 2011; Diehl & Stroebe, 1987). For interrater reliability, a subset of 295 ideas (25% of the total ideas) were randomly selected from the complete set of ideas and the interrater reliability using intraclass correlation coefficients (two-way random model) were found to be 86.8% for originality and 81.2% for feasibility.

## **Procedure**

The researcher randomly assigned the participants to one of the two conditions (anonymity and identified). The researcher used electronic communication through a zoom video chat modality. Zoom is a video conferencing portal through which participants can exchange messages with each other virtually. The audio and video mode were muted during the sessions so that participants could only have the option to exchange messages with each other using the “chat” option. All messages were time-stamped and could be seen by all participants on the screen. Please see Appendix B for the detailed procedure with time.

**Identified condition.** After entering the lab, all participants received a welcome note and were instructed to take a seat at any computer terminal randomly. Next, the participants signed the informed consent (see Appendix C). The first session was an introduction session. The experimenter assigned the participants with labels (such as Participant 1, Participant 2, Participant 3) that was used throughout the experiment. The experimenter asked the participants to sit together face to face and provided the group with a handout that had instructions (see Appendix D) to introduce each participant in terms of the following: hobby/interest, ethnicity, city of birth, the languages they speak and future career goal. One person in the group volunteered to fill in the handout for all the participants. This task lasted for five minutes. Next, the participants signed into zoom as Participant 1, Participant 2, and Participant 3, respectively. The experimenter created breakout rooms by assigning the three members (who had the introduction session earlier) to the same breakout room.

The researcher then handed out the given Osborn's (1953) rules with additional instructions (see Appendix F). After all participants read the rules and instructions, the experimenter sent the brainstorming topic (see Appendix G) to the participants via zoom. The brainstorming topic was also displayed on an overhead projection. The participants had 10 minutes to brainstorm ideas on the topic of "how to improve their university" (see Appendix G). The groups in each breakout room could only view the messages of their group members, not the other groups. After 10 minutes, the experimenter sent instructions to stop the brainstorming task. The next session was the ideas selection task. The participants received the instruction to choose the best five ideas from the generated list (see Appendix H) in the next 10 minutes. The definitions of feasibility and originality were displayed on an overhead projection. In the third session, the experimenter instructed the participants to refine the selected ideas to make them

feasible as well as original in another 10 minutes (see Appendix I). The instructions for the refinement task was also displayed on an overhead projection. At the end of the refinement session, the experimenter disconnected the zoom session and saved the conversation in a word document by assigning a pseudonym to each group.

**Anonymous condition.** Upon entering the lab, the participants in the anonymous condition received a welcome note and were instructed to take a seat at any computer terminal randomly. All participants were first presented with information about the study. Next, the participants were invited to sign the informed consent (see Appendix C). The experimenter assigned the participants with labels (such as Participant 1, Participant 2, Participant 3) that was used throughout the experiment. They then filled in a self-introduction questionnaire on a handout. On the questionnaire, they filled in information about themselves in terms of hobby/interest, ethnicity, city of birth, the languages they speak, and future career goals (see Appendix E). The self-introduction questionnaire was not shared with the other participants. After completion of this task, the experimenter invited the participants to a zoom conferencing session where all brainstormers were able to view each other's anonymous ID on the screen. The participants signed into zoom as Participant 1, Participant 2, and Participant 3, respectively. Similar to the identified condition, if the session had multiple groups of three to four participants, the experimenter created breakout rooms to separate each group. The members in each breakout room could only see the messages of their group.

The researcher then handed out Osborn's (1953) rules with additional instructions (see Appendix F). After all participants read the rules and instructions, the experimenter sent the brainstorming topic (see Appendix G) to the participants via zoom. The brainstorming topic was also displayed on an overhead projection. The participants had 10 minutes to brainstorm ideas on

the topic of “how to improve their university” (see Appendix G). After 10 minutes, the experimenter sent instructions to stop the brainstorming task. The next session was the ideas selection task. The participants received the instruction to choose the best five ideas from the generated list (see Appendix H) in the next 10 minutes. The definitions of feasibility and originality were displayed on an overhead projection. In the third session, the experimenter instructed the participants to refine the selected ideas to make them feasible as well as original in another 10 minutes (see Appendix I). The instructions for the refinement task was also displayed on an overhead projection. At the end of the refinement session, the experimenter disconnected the zoom session and saved the conversation in a word document by assigning a pseudonym to each group.

To conclude the experiment, the participants in both of the above conditions completed the post-experiment questionnaire (see Appendix J). This questionnaire was used for manipulation check (first item), and the rest of the items was used to measure the thoughts and feelings of the participants as used by previous researchers (Baruah & Paulus, 2011; Dugosh et al., 2000). The experimenter then debriefed and thanked the participants for dismissal (see Appendix K).



## Results

### Manipulation Check

For manipulation check, I asked the question, “Could you identify the members of your brainstorming group?” for which the participants had to respond “yes” or “no.” Three participants were excluded from this sample due to not completing the post-experimental questionnaire. Among the participants under the identified condition, 91% responded “yes,” while 9% responded “no.”

The chi-square test revealed a significant effect,  $X^2 (1, n = 89) = 27.512, p < .001$  indicating a difference between anonymous and identified condition in terms of their response to the perception of anonymity. The manipulation for anonymity was successful.

### Stages of innovation

A 2 anonymity (anonymity/identified) x 3 stages of innovation (brainstorming/selection/refinement) mixed factorial ANOVA was used to analyze the data. There was a significant main effect of the stages of innovation in terms of originality [ $F (1.642, 45.978) = 34.032, p < 0.05$ ] (using Greenhouse-geisser). There was a significant difference in terms of good quality ideas between the stages of innovation [ $F (2, 56) = 25.771, p < 0.05$ ] (using sphericity assumed) (see Table 2). There was no main effect of stages in terms of feasibility.

The Bonferroni post hoc test revealed that the refinement stage of innovation ( $M = 3.212, SE = 0.111$ ) produced ideas of significantly higher average originality than the selection stage ( $M = 2.427, SE = 0.075$ ) and brainstorming stage ( $M = 2.658, SE = 0.056$ ) (all  $p$ 's  $< .05$ ).

Additionally, the brainstorming stage ( $M = 2.658, SE = 0.056$ ) produced ideas of significantly

higher average originality than the selection stage ( $M = 2.427$ ,  $SE = 0.075$ ) ( $p < .05$ ) (see Table 1).

The Bonferroni post hoc test for good quality ideas revealed that the refinement stage ( $M = 0.606$ ,  $SE = 0.058$ ) of innovation produced ideas of higher average of good quality than the brainstorming stage ( $M = 0.332$ ,  $SE = 0.021$ ) and selection stage ( $M = 0.280$ ,  $SE = 0.041$ ) (both  $p$ 's  $< .05$ ). There was no significant difference between the brainstorming and the selection stage of innovation in terms of good quality ideas (see Table 1). Hence, hypothesis 1 was partially supported.

### **Anonymity Condition**

There was no significant main effect of the anonymity condition for originality or good quality ideas. However, there was significant main effect in terms of feasibility,  $F(1, 28) = 7.850$ ,  $p < 0.05$  (see Table 2). The anonymous condition ( $M = 3.485$ ,  $SE = 0.109$ ) produced ideas of higher average feasibility than the identified condition ( $M = 3.054$ ,  $SE = 0.109$ ) (see Table 1). Thus, hypothesis 2 was partially supported for feasibility but not for originality and good quality ideas.

### **Interaction Between Stages of Innovation and Anonymity Condition**

There was no significant interaction between the stages of innovation and anonymity in terms of originality and feasibility. However, there was a significant linear interaction between the two independent variables in terms of good quality ideas,  $F(1, 28) = 4.258$ ,  $p < 0.05$  (see Table 2). The groups under anonymous condition generated ideas of highest average quality in the refinement stage of innovation than the rest of the conditions (see Figure 1). Therefore, hypothesis 3 was partially supported.

## Discussion

The current study investigates the effects of anonymity on the stages of innovation among collaborative groups in the computer-mediated communication paradigm. In support of Hypothesis 1, the refinement phase of innovation led to the highest creativity in terms of originality and good quality ideas. Consistent with past studies (e.g., Paulus, Baruah, & Kenworthy, 2018; Rietzschel, Nijstad, & Stroebe, 2017), we found that selected ideas were not better than the generated ideas. Blair and Mumford (2007) found that individuals tend to avoid risky ideas since consequences are involved, hence selected ideas are not more original than the generated ideas. However, the refinement stage of innovation allowed the participants to focus on and analyze the ideas to make them more original and of good quality (Watts, et al., 2019). The deeper appraisal of ideas may have led to further evaluation to make ideas higher in originality (Blair and Mumford, 2007).

Additionally, the specific instructions to focus on quality at the refinement stage was beneficial in enhancing creativity. Rietzschel, Nijstad, and Stroebe (2010) reported that when given proper instructions, individuals were better at selecting high-quality ideas. The dual pathway model of creativity (Nijstad, De Dreu, Rietzschel, & Baas, 2010) suggests that an individual can follow two paths to create ideas. The *flexibility* pathway is associated with a wide range of ideas due to switching among multiple topics (categories), and making remote associations, resulting in a higher quantity of ideas. The second is the *persistence* pathway, which is associated with a deeper exploration of fewer categories, with more insight into the problem, hence more original ideas. In the current study, performance at the generation stage could be associated with the flexibility pathway. In the generation stage, participants were instructed just to generate as many ideas as possible. Thus, their attention may have been towards generating “more” ideas. In contrast, in the refinement stage of innovation, participants

engaged in a more in-depth exploration where they focused on a small set of ideas resulting in ideas of higher originality.

The results of the current study revealed that the feasibility of ideas did not increase from the selection to the refinement phase, whereas originality and average good quality did increase at the refinement stage. Thus, it is evident that the feasibility bias was minimized due to the additional opportunity of the groups to evaluate ideas at the refinement stage of innovation. Past findings reveal that people have difficulty in identifying original ideas even when they are good judges (Runco & Chand, 1994); however, ongoing evaluation of ideas helps in offsetting the feasibility bias (Licuanan, Dailey & Mumford, 2007). The current study reveals that the opportunity to actively evaluate and refine the ideas to make them both feasible and original reduced the feasibility bias and, at the same time, enhanced originality and hence overall quality.

Consistent with hypothesis 3, anonymous groups generated the highest quality of good ideas at the refinement stage of innovation. The enhanced creativity of these groups in the refinement stage may be due to the added opportunity to evaluate the ideas at the refinement stage under anonymous conditions. The performance was magnified by anonymity because the participants were not distracted by the identity of their group members and hence did not engage in social norms (McLeod, 1997). Adhering to social norms can cause risk factors such as evaluation apprehension (Stobbeleir, Ashford, & Buyens, 2011). The lack of identification clues in the anonymous condition, along with a more in-depth focus on a few selected ideas at the refinement stage, might have facilitated the expression of better ideas, favoring higher creativity.

The SIDE describes how individuals identify themselves within the group so that they may achieve social norms within the group (Huang & Li, 2016). According to the model, anonymity encourages group members to pay less attention to personal differences (Lea, et al.,

2001). Consistent with the SIDE model and the findings of Henaff, Michinov, and Bohec (2018), the results of the current study indicate that the creativity task in the anonymous condition allowed participants to focus more on the creativity task at hand and less on the within-group differences. Additionally, performance was best at the refinement stage as the task of evaluation at this stage called for a more in-depth attention compared to the idea generation and selection stage.

Surprisingly we found that the anonymous condition did not outperform the identified condition in terms of originality and good quality ideas as we predicted. Rather, anonymous groups generated ideas of higher feasibility than the identified condition. One reason could be that anonymous groups are likely to engage in social loafing than the identified condition (Kahai, Sosik & Avolio, 2003). Social loafing refers to the lack of motivation to contribute while collaborating with other individuals in a group (also called free-riding) (Meyer, Schermuly, & Kauffled, 2016). Harkins and Szymanski (1989) found that social loafing reduces the level of creativity in groups. The performance of the participants might have been hindered due to social loafing as the members were unidentified. However, the hindrance due to social loafing was minimized at the refinement stage as there was a need for in-depth focus at this stage. In the current study, I did not control social loafing. Future studies should take this factor into account while manipulating anonymity in groups.

Another reason for suboptimal performance of anonymity condition could be the limited time frame allowed for the participants to refine the ideas. Baltes, Dickson, Sherman, Bauer, and LaGanke (2002) found that anonymous conditions required more time when processing information and making a decision compared to the non-anonymous condition. The current study allowed a limit time of ten minutes to complete the task at the refinement phase. If the

anonymous conditions felt time-pressured, a loss of motivation for processing the information could have occurred (De Dreu, 2003).

### **Limitations**

One limitation of the current study was that participants from two different university campuses participated in this study. The two campuses differed demographically as one campus had primarily non-traditional students, and the other had mostly traditional students. Non-traditional students have higher intrinsic motivation to perform well than traditional students (Bye, Pushkar, & Conway, 2007), which could have impacted their performance in the task. Secondly, the students of one campus were younger in age, whereas the ones on the second campus were older, and most of them were working. The current study did not control for the variable of age. Age-related diversity can have an impact on performance as age can offer different life experiences as well as perspectives that can impact creativity (Paulus & Brown, 2007). Another limitation was the lack of focus from the participants. Although instructions were given to the participants via zoom, some participants did not follow the instructions and asked questions to clarify. Future studies should consider giving the participants a printed copy of instructions to prevent miscommunication.

### **Future Implications and Conclusion**

The findings of the current study highlight the sociotechnical impacts on creative processes in electronic communications. The creative performance of an individual in a computer-mediated communication is an outcome of the interaction of social processes such as anonymity and refinement. It was interesting to note that given an opportunity to evaluate the decision after making the decisions, groups could come up with more creative decisions.

The findings are significant in a real-world setting because the organizations can use the additional paradigm of refinement in the anonymous condition to create the best ideas, thereby facilitating team innovation. Diversity is gradually becoming standard in organizations (Homan, Gundemir, Buengeler, & van Kleef, 2020). Past studies have revealed that diversity is “a double-edged sword” (Williams & O’Reilly, 1998, p. 79). On one hand, diversity in groups can open doors to different perspectives, which can lead to enhanced creativity (Paulus & Brown, 2007) and on the other hand, diversity can lead to conflicts (Harvey, 2013), resulting in reduced productivity. Hence, it is essential to manage diversity in the organization, and one way to manage diversity is to promote anonymity in a team innovation context.

**Table 1-Descriptive Statistics**

<b>Dependent Variables</b>	<b>Condition</b>	<b>Brainstorming <i>M(SE)</i></b>	<b>Selection <i>M(SE)</i></b>	<b>Refinement <i>M(SE)</i></b>
Originality	Anonymous	2.646(0.079)	2.560(0.106)	3.353(0.157)
	Identified	2.670(0.079)	2.293(0.106)	3.070(0.157)
<b><i>MM</i></b>		2.658	2.427	3.212
Feasibility	Anonymous	3.362(0.081)	3.600(0.122)	3.492(0.177)
	Identified	3.021(0.081)	3.000(0.122)	3.140(0.177)
<b><i>MM</i></b>		3.192	3.300	3.316
Good Quality Ideas	Anonymous	0.292(0.030)	0.307(0.057)	0.688(0.082)
	Identified	0.352(0.030)	0.253(0.057)	0.523(0.082)
<b><i>MM</i></b>		0.322	0.280	0.606

*Note:* MM = Marginal means for the stages of innovation.

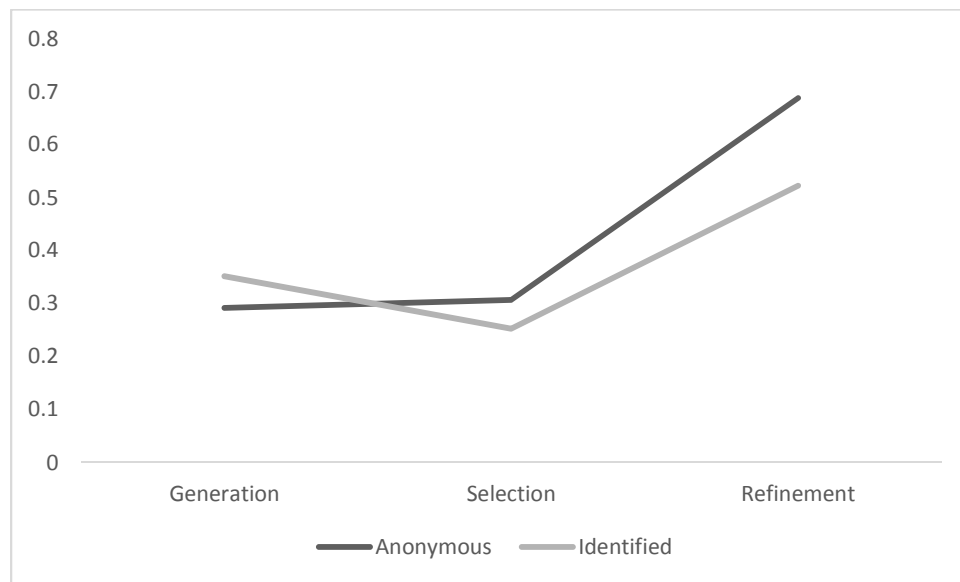


**Table 2-Within- and Between-Subjects Test**

Measures	Source	Df	F	Significance	Partial Eta Squared
Originality	Stages	1.64/45.98	34.032**	.000	.549
	Group	1/28	2.023	.166	.067
	Stages*Group	1.64/45.98	1.555	.224	.053
Feasibility	Stages	2/56	1.052	.356	.036
	Group	1/28	7.850*	.009	.219
	Stages*Group	2/56	1.236	.298	.042
Good	Stages	2/56	25.771**	.000	.479
Quality	Group	1/28	.689	.413	.024
Ideas	Stages*Group <sub>a</sub>	1/28	4.258*	.048	.132

*Note.* \*\*  $p < .001$ , \*  $p < .05$ . a = there was a significant linear interaction effect between the stages of innovation and the anonymous condition in terms of good quality ideas.

**Figure 1-** *"Good Quality Ideas" Interaction*



*Note.* Interaction between anonymity and stages of innovation in terms of “good quality ideas.”

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## Appendix A

### Experiment Design

	Stages of Innovation		
	Brainstorming	Selection	Refinement
Anonymity			
Identified			

The design is 2 x 3 mixed factorial design with two anonymity (anonymous and identified) conditions and three stages of innovation (Brainstorming, Selection, and Refinement). Stages of innovation is a within-subject design.

Appendix B  
Procedure Times

<b>Identified</b>	<b>Anonymous</b>	<b>Time (mins)</b>
Informed consent	Informed consent	5
Introduction (shared)	Introduction (unshared)	5
Osborn's Rules	Osborn's Rules	5
Brainstorming	Brainstorming	10
Idea Selection	Idea Selection	10
Idea Refinement	Idea Refinement	10
Post Experiment Questionnaire	Post Experiment Questionnaire	5
Debrief & Thank	Debrief & Thank	5

Appendix C  
Informed Consent

## **Informed Consent**

**Purpose:** Today's organizations seek opportunities to build a successful business. Organizations must evaluate many ideas before arriving at a good quality idea. The main objective of this research is to enhance the quality of ideas that is generated through brainstorming through electronic interaction.

**Study Procedure:** Interaction with others will be completed through a computer screen. You will have to type on a keyboard to be able to communicate with your peers. You will be given instructions on how to complete the task in each session. The study will last approximately one hour.

**Your Right to Withdraw:** You have the right to discontinue the study at any time during your participation.

**Benefits:** This study does not guarantee benefits for the participants. Participants can become knowledgeable of how research is proceeded.

**Risk:** This study has minimal risk.

**Estimated Time:** It will take approximately one hour to complete the study.

**Researcher Contact Information:** This study will be conducted by Keesha Green from the Graduate Department of Psychological Sciences. Any questions about the study should be sent to [Keesha.Green@go.tarleton.edu](mailto:Keesha.Green@go.tarleton.edu).

By signing this form, you acknowledge that you understand the information in accordance to the study.

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Participant's Signature

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Today's Date

## Appendix D

### Introductory Task Using Background Information for Identified Groups



	Participant 1	Participant 2	Participant 3
Gender			
Major			
Ethnicity			
City of Birth			
Languages you speak			
Future Career Goal			

## Appendix E

### Self-introductory Task Using Background Information for Anonymous Groups

Participant ID: \_\_\_\_\_

Please answer the following information about yourself:

1. Gender: \_\_\_\_\_
2. Major: \_\_\_\_\_
3. Ethnicity: \_\_\_\_\_
4. City of Birth: \_\_\_\_\_
5. Languages you speak: \_\_\_\_\_
6. Future Career Goal: \_\_\_\_\_

## Appendix F

### Osborn's Rules & Additional Rules

Group brainstorming has evolved into a creative experience for organizations to gather unique ideas to implement for a successful outcome. Many studies have built a foundation on Osborn's (1953) rules in order to produce a good quantity of ideas. Modern organizations today search for brainstorming procedures that will enhance not just the quantity of ideas, but the quality of ideas generated by participants as well. During this experiment, you will participate in three sessions. During the sessions, you are required to apply Osborn's rules (rules 1-4) as well as these additional rules:

1. **Quantity is wanted.** Produce as many ideas as possible.
2. **Free willing is encouraged.** Each idea can lead to another idea that may be better.  
Generate as many ideas to produce better ideas.
3. **Criticism is not allowed.** Participants opinion of ideas will not be allowed. Every idea is welcomed.
4. **Combine and improve ideas.** Combination of ideas can produce better ideas. Be willing to improve ideas of two or more ideas.
5. **Stay focused on the task.** Concentrate on the problem at hand and avoid engaging in irrelevant thought processes and discussions.
  - i) Do not tell stories. We are only interested in your ideas. Do not tell stories about your experiences.
  - ii) Do not explain ideas. Do not expand on why you think something is good or bad.  
Simply state your idea and continue with the next ideas.

Appendix G

Instructions and Topic

During this session, you will generate ideas over the given topic. You will type each idea you generate into the zoom chat window. Through submission, your group members will be able to view your ideas. To submit each idea, you will need to push the “enter” key. You will have 10 minutes to generate your ideas. Remember the rules given to you. Combine ideas, freewheeling is welcome, quantity is wanted, and criticism is not allowed.

The topic that you will generate ideas from is: How to improve Tarleton State University (TSU)? Basically, we would like you to generate ideas or ways to improve TSU. Any suggestions you have about how to make TSU better are appropriate.

Appendix H

Selection Session Instructions



During this session, you will collaborate with your group members to select the five best ideas out of your group's overall generated ideas. Type those ideas by rank-ordering them from first best to the fifth-best idea. The ideas must be feasible as well as original. Your group will have ten minutes to complete the task.

*Feasibility:* Feasibility was defined as the extent to which an idea was relatively easy or feasible to adopt. It may or may not be a good idea. The point is to capture the degree to which the idea is one that could actually be done without a lot of effort or cost.

*Originality:* Originality referred the degree to which an idea is usual, unique, or unlikely to be mentioned by others. It may or may not be a good idea. The point is to capture the degree to which the idea is one that many or few individuals would be likely to generate.

Appendix I  
Refinement Session Instructions

In this 10 minute session, you will collaborate with your group members to refine the five best ideas that your group has selected. Refine each idea to make it both feasible and original.

The definition of feasibility and originality are given below:

*Feasibility:* Feasibility was defined as the extent to which an idea was relatively easy or feasible to adopt. It may or may not be a good idea. The point is to capture the degree to which the idea is one that could actually be done without a lot of effort or cost.

*Originality:* Originality referred the degree to which an idea is usual, unique, or unlikely to be mentioned by others. It may or may not be a good idea. The point is to capture the degree to which the idea is one that many or few individuals would be likely to generate.

Appendix J

Post-Experiment Questionnaire

Participants no: \_\_\_\_\_

Please complete this questionnaire of your participation in this study. This questionnaire will inform the experimenter of your overall satisfaction with your experience in the study. The following scales rate your satisfaction response towards the study. You should try to make your response selection as accurate as possible.

1. Could you identify the members of your brainstorming group?

\_\_\_\_\_ Yes

\_\_\_\_\_ No

2. How different were the ideas that you generated different from the ideas your peers generated?

1      2      3      4      5      6      7      8      9

Very Similar

Very Different

3. How would you rate the combination of the quantity of your ideas?

1      2      3      4      5      6      7      8      9

Very Low

Very High

4. Were you able to build new ideas from your peers' ideas?

1      2      3      4      5      6      7      8      9

Not at all

Very Much

5. How would you rate the quality of ideas that your group generated?

1      2      3      4      5      6      7      8      9

Very Few

Very Many

6. How would you rate the quality of ideas that your group selected?

Very Low Very High

Very Low Very High

Not at all Very Much

Not at all Very Much

Not at all Very Much

Not at all Very Much

Not at all Very Much

Not at all Very Much

14. How motivated were you to complete the task?

1      2      3      4      5      6      7      8      9

Not at all motivated

Very Motivated

Appendix K  
Debrief Statement



The experiment that you have just participated in today is geared towards helping organizations and companies become better equipped to survive in this competitive society. Many organizations are using technology to communicate with employees from far distances. This study goal is to help improve communication virtually within companies and organizations. Due to the ongoing purposes of this study, I ask if you could please not share this experience with anyone. Thank you for your time and participation.

