Investigating different Degrees of Anonymity in the Creative Idea Generation Process

Author: Leon René Gohla
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT

Background: The creative idea generation process plays a crucial role in the creation and commercialization of novel business value. In the current methodology, identified ideation is assumed to facilitate social loafing, while anonymous ideation reduces task effort. It appears we find two equally limited *'traditional'* methods.

Objective: The objective of this study is to investigate whether the new hybrid form of selective anonymity generates more great ideas in the computer-mediated ideation process than either of the two traditional methods.

Methods: In a laboratory setting, an ideation session was conducted to measure the performance of the best generated ideas in novelty, business value, and consumer purchase intent. A follow-up process questionnaire measured evaluation apprehension and social loafing in-between conditions of different degrees of anonymity.

Findings: Anonymity in the virtual ideation process provides more maximum business value and -purchase intent, selective anonymity performs best in purchase intent. The underlying social dynamics are unaffected by the degrees of anonymity but predict performance.

Conclusion: The findings facilitate the theoretical superiority of anonymous ideation over the identified method for two central outcome metrics of successful product development. Selective anonymity suggests an improvement over identified practice, but not over the anonymous method, providing limited but promising insights for the new hybrid form of anonymity.

Graduation Committee members:

Keywords

1. RESEARCH SITUATION

Practically all organizations develop ideas about products, services, or procedures in their innovation process. The creative idea generation process, or 'ideation', hence plays a role in the creation and commercialization of novel business value. The most common form of ideation is widely known as brainstorming, the funneling nature of which seeks to create several ideas before picking the best one. But the evolution of ideation is complex, filled with observed problems, novel solutions, and more resulting problems.

To begin with, consider the most basic form of ideation: Brainstorming. The effectiveness of brainstorming is questioned due to 'evaluation apprehension' (Girotra et al., 2011), referring to the hesitation of sharing ideas out of concern for disapproval by group members. It is mostly observed in settings where team members can be identified (e.g., traditional brainstorming), and is quite natural. Arguably, most people have 'wasted' time before, contemplating whether to speak out a thought or not. Unsurprisingly, evaluation apprehension is found to reduce brainstorming effectiveness (Zhou et al. 2019), after all, any thought may have been the breakthrough in a discussion.

Introducing anonymity into the process promises to reduce the effects of evaluation apprehension (Shepherd et al., 1995). If ideas cannot be identified, people may disapprove of the idea, but they cannot point at its respective creator for it. Such full anonymity implies no verbal interaction between members. This 'non-interactive' ideation is mostly conducted in written form. Compared to identified ideation, anonymity has been found to improve group performance (Connolly et al., 1990), supposedly solving the problem of evaluation apprehension in ideation.

But the complete absence of public recognition for task effort has been criticized for stimulating 'social loafing' (Chang, 2011; McLeod, 2011). Often referred to as free-riding, social loafing means the process of deliberately not contributing to a shared team objective in the presence of active group members. The simplified logic behind suggests that if nobody can know whether a given member even developed an idea, why bother?

So it seems that total identification and -anonymity both provide creative upside in the face of social pitfalls which trigger productivity loss. Identified- ideation stimulates social anxiety, while anonymous ideation reduces task effort. There is evidence both for and against either technique, but it appears we find two equally limited 'traditional' methods.

In response to this dilemma, McLeod (2011) has observed a potential solution: In the anonymous idea generation process, social loafing can be reduced by providing a basis for social comparison between members. This does not control for participation, but it provides intrinsic incentives. An example of this is a public acknowledgment for the most engaged members in settings. The idea behind this is to stimulate member motivation to be the one who is identified and thus, socially compared to other members. The obvious problem with this: comparison is not possible in total anonymity unless task effort is disclosed in some form.

1.1 Research objective and relevance

To contribute to the current state of anonymous ideation literature, this research paper introduces selective anonymity in the creative idea generation process, a hybrid method between identified and anonymous ideation. In an anonymous idea generation process, performance-based intrinsic rewards are offered. This is done by disclosing and acknowledging the best-ideas and their respective creators' ex post through electronic systems. The approach builds on reduced evaluation apprehension in anonymous idea generation, while stimulating participation to reduce the negative effects of social loafing. The objective of this study is to investigate whether the total or hybrid form of anonymity in the computer-mediated ideation process indeed inherits better ideas. This is done by determining the roles that evaluation apprehension and social loafing play in a unique research setting. This way, the paper contributes to improving idea generation methodology, leading to the following research question:

What is the effect of different degrees of anonymity on the performance of the best generated Ideas among students in the computer-mediated ideation process?

In theory, this paper addresses the dilemma of productivity loss in anonymous ideation literature. Drawing from social comparison- and self-determination theory, selective anonymity promises a theoretical foundation to overcome the limitations of identified and anonymous brainwriting methodology. By applying the extreme value logic found in innovation literature, the paper also introduces a novel methodology in anonymous ideation. Therefore, next to exploring the new hybrid form of anonymity, this research also promises to facilitate existing theory on traditional ideation and social psychology. Additionally, selecting the degree of anonymity in the creative idea generation process is generally flexible according to setting-specific needs and wants. Thus, this paper provides the starting point for a number of future research opportunities revolving around hybrid forms of anonymity in creative ideation.

In practice, on the other hand, the goal of this paper is to support the construction of a blueprint to enable organizations to find the best product concepts more quickly. Doing so promises a more efficient innovation process. The competitive advantage affiliated with the most basic of the innovation process, namely the generation of valuable business concepts is obvious. Furthermore, innovation is of central importance for any organization that seeks to evolve and sustain itself long-term. Henceforth, managers ought to have a great interest in stimulating more creative behavior among organizational members. This is of acute need, given the limitations found in both identified and anonymous settings.

2. LITERATURE

Table 1 gives an overview of some of the contributions which collaboratively introduced the methodology of identified ideation practices to the domain.

Table 1. Overview of identified ideation methodology

Research	Central contribution	Methodology
Osborne (1957)	Brainstorming	Interactive ideation
Rohrbach (1969)	Brainwriting	Non-interactive ideation
Nunamaker et al. (1994)	Electronic Brainstorming	Non-Interactive, computer-mediated ideation
Alavi (1993)	Electronic Brainwriting	Computer-mediated hybrid-interaction

2.1 An overview of identified Ideation
2.1.1 Brainstorming

The investigation of the creative ideation process has been of academic interest since Osborne's (1957) first iteration of the term *brainstorming*. Originally, his methods effectively relied on co-located group interactions to stimulate creative idea buildup

in a structured manner. Structured approaches to idea generation are to this day of great interest for most organizations that seek to evolve. The Innovation process in its nature is creative. However, countless socio-technical and economic developments since the release of Osborne's book have driven scholars and practitioners to explore innovative idea generation practices.

One social dynamic found to limit brainstorming was *production blocking* (Chang, 2011, Girotra et al., 2011, Diehl & Stroebe, 1987), describing the situation in which one participant is unable to contribute ideas while another participant speaks. Over time, two central trends in ideation practices can be observed in response to this. They set the fundament of ideation methodology for this thesis, namely the tendency for idea generation processes to happen *non-interactive* and *computer-mediated*.

2.1.2 Brainwriting

In 1968, Rohrbach presented the method 365, a non-interactive method, generally referred to as brainwriting. This technique lets co-located participants write down ideas rather than share them verbally (Rohrbach, 1969). The process would be evolved numerous times. Girotra et al. (2011) investigated the effects of group interaction on team performance in the generation of ideas for new commercial products. They found that teams, in which participants created ideas non-interactive, generated ideas of higher interest. Similar findings were presented by Mullen et al. (1991) who compared traditional brainstorming against non-interactive or 'nominal' ideation, finding increased idea quality and quantity in the latter as moderated by group size, empirically questioning the benefits of idea buildup in interactive settings.

2.1.3 Computer-mediated ideation

With the diffusion of household computers throughout innovation-driven economies in and around the 1990s, a wave of research emerged, that investigated the effects of computer-supported communication on productivity. Nunamaker et al. (1991) are credited for the introduction of electronic brainstorming at the time. But the findings of the new method on performance differed in-between studies, arguably due to highly diverse research designs and computer systems. Ocker et al. (1998) found that the positive effects of group support systems (e.g., chat forums) are strongest in idea-generation tasks and that the technology used has empirical effects. However, the hypotheses on increased effects on creativity, quality, and satisfaction were not validated. Aiken et al. (1994) compared electronic and verbal brainstorming and found evidence implying that electronic support improves satisfaction and reduces production blocking for large groups. Simultaneously, electronic brainwriting as a computer-mediated interpretation of Rohrbach's methodology emerged. It is uncertain who introduced electronic brainwriting into the literature in the early 1990s. Yet, the structured analysis of the new process can be traced back to Alavi (1993), who investigated asynchronous ideation systems in a corporate setting, finding increased satisfaction among participants. The 2000s saw a significant progression of digital communication systems, driven by the socio-technical normalization of information technologies, alongside an increasing geographical dispersion of teams in multi-national organizations. Chang et al. (2011) argue that by 2011, the virtual team structure has become the norm for idea generation in product development, as the development cycle can be sped up and costs are reduced by spreading the development efforts across multiple business units, which also suggests the potential to tap into global resources more easily.

2.2 Pitfalls of Identified Ideation

The 2010s ideation literature frequently covers the investigation of non-interactive and virtually conducted ideation. For the starting point of this research, the computer-supported idea-generation process is considered the standard in modern organizations, as suggested by Chang (2011), and adopted frequently throughout the COVID-19 pandemic. However, the existing methodology inhibits some limitations, found in underlying social dynamics which trigger productivity loss.

As investigated historically, non-interaction is suggested to provide numerous benefits over the interactive exchange of ideas in identified settings. However, *evaluation apprehension* with respect to perceived social dominance is frequently referred to by scholars. Social dominance, in this sense, refers to status achieved by social position, seniority, or expertise and generally characterizes members that contribute a lot of task-related content (Chang et al., 2011). That being said, the effects of individual evaluation apprehension are assumed to be reduced in virtual settings (Chang, 2011; Girotra, 2011). Yet, Zhou et al. (2019) still found that evaluation apprehension in collaborative idea generation has a significant negative effect on idea quantity and diversity, but no measurable effect on idea novelty. While the true role of evaluation apprehension thus is unclear in electronic settings, the academic consensus in the literature assumes idea generation performance to be limited in many identified group settings.

2.3 An overview of Anonymous Ideation

Introducing *anonymity* into the idea generation process is suggested to limit the effects of evaluation apprehension, due to the unconstrained sharing of ideas (Chang et al., 2011) and the facilitation of participation in controversial discussions (McLeod, 2011). But the real implications of anonymity are debated. Pissarra and Jesuino (2005) found empirical evidence for increased satisfaction in computer-mediated and anonymous teams, but not for idea diversity. Connolly et al. (1990) found a positive relationship between anonymity on idea novelty and commitment, but not on output quality. A case study by Chang et al. (2011) investigated the benefits of virtual teams with anonymity and structured interactions, finding high-quality output, but low idea novelty. While these findings of anonymity on performance differ depending on the setting and dependent variable, there is little empirical contradiction on group outcomes. Idea quality appears to be positively affected by anonymity, whereas there are some inconclusive findings on idea novelty and quantity. There is no empirical evidence for or against improved idea diversity. This suggests that outcome metrics appear to be related and inhibited by evaluation apprehension, urging the need for new approaches.

2.4 Pitfalls of Anonymous Ideation

But as hinted at earlier, anonymity in ideation has social l. It implies a tendency for increased *social loafing* (Chang et al., 2011; McLeod, 2011), risking less effective ideation sessions. McLeod (2011) argues that the absence of public recognition for task effort may reduce motivational power. In her study, she draws from social-comparison theory, which suggests the provision of a basis for social comparison stimulates task participation, to compare the effects of identified rewards with anonymous rewards in the ideation process. Her findings show that identified rewards increase task effort and thus counter social loafing. In line with this, Muzafary et al. (2021) investigated the role of intrinsic motivation, by providing intrinsic rewards for employee creativity. They argue that public acknowledgment increases task motivation and creativity and found intrinsic rewards to stimulate creative behavior, as mediated by intrinsic

motivation. Hence, there is empirical evidence that the negative effects of social loafing on performance in the anonymous idea generation process can be reduced by providing intrinsic rewards that offer a social comparison, such as public acknowledgment for task effort.

2.5 An Overview of Ideation Performance

Lastly, irrespective of the discussed social mechanisms, the question arises of how to conceptualize good or bad ideation outcomes. Numerous performance metrics have been identified in line with different research designs and purposes. The social psychology literature primarily focuses on process metrics such as motivation, task effort, or satisfaction (Pissarra & Jesuino, 2005; McLeod, 2011), measured in participation frequency or interaction patterns. Output metrics aimed to create a wide spectrum of ideas are diversity, novelty, and creativity (Chang, 2011; Zhou et al., 2019; Pissarra; Muzafary et al., 2021), all of which are assessed ex-post by a group of independent raters. Finally, idea quantity and idea quality are frequently used to assess idea generation performance (Girotra et al., 2011; Ocker et al.; 1998). Idea quality in the product development context can be measured twofold, by assessing quality as a multidimensional construct with independent raters, or with purchase intent surveys among the target audience, commonly by focusing on the mean quality of the generated ideas.

3. THEORETICAL FRAMEWORK
3.1 Comparing Degrees of Anonymity

The ideation performance among the selectively anonymous group is compared with two traditional methods of fully identified and fully anonymous ideation. The next subsections are dedicated to giving an overview of the different degrees of anonymity compared in this paper. Along with the respective degrees, the anticipated observations for evaluation apprehension and social loafing are elaborated in this section. After elaborating on how ideation performance will be measured, the implications of social dynamics on ideation performance in the respective groups are discussed in sections 3.3 and after.

3.1.1 Defining Identified ideation

In the identified ideation process, which is the first of the two traditional methods investigated, all information from the ideation is disclosed ex-post. This is comparable to electronic brainwriting used in real-life organizations. While the complete disclosure of relevant information to the group suggests little tendency towards social loafing due to direct social comparison (McLeod, 2011), evaluation apprehension in this technique is a limiting factor.

3.1.2 Defining Anonymous ideation

In the anonymous idea generation process, no information is revealed to the group after the task. The absence of identifiable material for the group limits members from assessing other members' ideas and the electronic non-interaction should limit perceptions of social dominance (Chang et al, 2011; Girotra et al, 2011). This implies reduced effects of evaluation apprehension on ideation performance. But the absence of social comparison through identifiable task outputs is problematic. Intrinsically motivated participants may feel less desire to participate due to the absence of public acknowledgment for their task effort (McLeod, 2011). Meanwhile, intrinsically unmotivated members are not stimulated to participate due to the absence of public pressure. The implications

3.1.3 Defining Selectively anonymous ideation

In the selectively anonymous idea generation process, idea and creator information is only revealed for the best generated ideas. By only providing information regarding excellent ideas, less socially dominant members in a group do not have to worry about their ideas being judged or deemed of underwhelming value (Chang et al., 2011). Simultaneously, members are being stimulated to participate actively based on social comparison theory (McLeod, 2011), expressed through intrinsic rewards (Muzafary et al., 2021).

3.2 Determining Ideation Performance

In the context of this research, the focus lies on the innovation process in commercial organizations as suggested by Girotra et al. (2011). The extreme value logic is applied by focusing only on the best ideas to assess ideation performance. Thus, the goal of the experiment is to maximize opportunity creation when suggesting novel idea generation methods.

While most structured innovation processes start with a large number of ideas, the ultimate objective is generally to reduce the quantity again to select the best idea, which is to be brought to market. Thus, a large quantity of ideas is not of central importance in this research. Focusing on the average quality of ideas also does not deliver what organizations seek. The generation of moderate or bad ideas should not affect the selection of excellent ideas. Applying this extreme value logic, group idea generation performance ought to be assessed based on the best idea generated in the process, while accepting the generation of moderate and low-quality ideas as a byproduct.

To assess the ideas, it is common for scholars to use idea quality as a single concept, but the opinions differ about its operationalization. Performance of the best generated ideas will instead be assessed based on several subdimensions of importance in the innovation setting. Idea Novelty, Business Value, and Consumer Purchase Intent have been determined in the common agreement of the research project members, based on Girotra et al.'s (2011) and Chang`s (2011) research efforts.

3.2.1 Defining Novelty, Business Value, and Purchase Intent

Idea Novelty investigates the degree to which a product concept poses a new configuration of value compared to the existing market. This is of relevance as innovation processes are meant to continuously challenge the norm, investigating the creative potency of the idea generation processes.

On the other hand, business Value is dedicated to the commercialization potential an idea inherits. This considers the utility an idea provides to an organization, that is seeking to develop a product in the field of sport and fitness for the student market.

Lastly, purchase intents investigate the desire to purchase a product concept, that a target consumer perceives. This is indicative of the customer sentiment towards a new product and ultimately represents the market potential from the customers' point of view.

3.3 Effects of Social Dynamics on Ideation performance

After discussing different degrees of anonymity and the performance criteria, the following section is dedicated to connecting social loafing to ideation performance. Assuming that group performance is assessed based on the best ideas generated, it is central to stimulate participants' creative behavior. When team members reduce their contribution to shared team objectives it can reduce the likelihood of realizing group goals.

One approach to solving this would be to monitor contributions while adjusting social loafing through extrinsic rewards, such as monetary compensation or the avoidance of punishment. Motivating participants this way would likely not improve the quality of the best idea generated. That is because monitoring contribution this way can stimulate members to contribute just enough, suggesting increased quantity at the risk of quality. However, it is not just the absence of contribution that problematizes social loafing, but also the waste of creative potential. This urges the need for members who are intrinsically motivated for ideation. Public acknowledgment as an intrinsic reward affects task motivation and stimulates creative behavior (Muzafary et al., 2021). Thus, considering social comparison-ability across the groups, social loafing in selectively anonymous ideation is expected to be the same as in the identified treatment but lower than in the anonymous method. Combined with the theorized implications of social loafing on performance, this leads to the following Hypothesis:

H1: Social Loafing is lower in Selectively Anonymous- than in identified ideation, which in turn predicts increased idea generation performance among generated ideas.

This paragraph connects evaluation apprehension with Ideation performance in the context of the degrees of anonymity in question. Similar to the deliberate withdrawal, the hesitation to share ideas due to social constraints reduces the likelihood of generating any idea with the potential to be great. Specifically, evaluation apprehension can be argued to be strongest for ideas that contradict what is considered to be close to the norm. Breaking the norm, however, is a central characteristic of the innovation process. Applying Schrödinger's logic here, an idea is neither good nor bad until it is spoken out. The extreme value approach ignores ideas that are not excellent, urging participants to contribute regardless of potential idea value. Countless historic case examples have shown that niche innovation trajectories are more powerful when neglected by the dominant socio-technical regime. This urges the need to reduce the restriction of creativity due to social constraints. Both ignorance by socially dominant members and evaluation apprehension by socially submissive ones waste opportunities for excellent ideas to be generated. Considering that anonymity is assumed to limit the perception of social dominance, evaluation apprehension in the selectively anonymous group is assumed to be perceived the same as in the anonymous group, but lower than in the identified group, resulting in the second hypothesis below:

H2: Evaluation apprehension is lower in Selectively Anonymous-than in identified ideation, which in turn predicts increased idea generation performance among generated ideas.

3.4 Effects of Degree of Anonymity on Ideation Performance

Combining the two mediating hypotheses that connect the degree of anonymity with the performance of the best generated ideas, we can make assumptions regarding the direct relationships of different degrees of anonymity on the performance of the best generated ideas. While there is no evidence regarding such causality between these concepts in prior literature, a successful mediation relationship implies a direct correlation. In this case, the relationship is of central interest to determine the value of innovative ideation methodology. Thus, tying back to the claims made on the underlying social dynamics, the following hypotheses are established:

H3: Idea Generation Performance of the best generated ideas is better in Selectively Anonymous- than in Identified ideation.

H4: Idea Generation Performance of the best generated ideas is better in Selectively Anonymous- than in Anonymous ideation.

3.5 Conceptual Framework

Based on the discussed literature and the implications derived from the underlying theory, Figure 1 displays the conceptual framework used to determine the effects of selective anonymity on the dependent variables and the roles of the theorized underlying social dynamics.
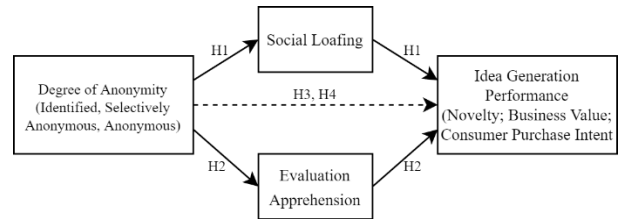

Figure 1. Conceptual Framework

4. RESEARCH METHODOLOGY
4.1 Research Design

To collect data on different degrees of anonymity in the creative idea generation process, an experiment was designed by Dr. Tim Schweisfurth. This was launched at the University of Twente in 2019. The research design contained an ideation task, which allowed for the measurement of all generated ideas, as well as evaluation apprehension, and social loafing under different degrees of anonymity. A between-subjects experiment was employed, in which all subjects received the same task, but were randomly assigned to the three different groups. As opposed to a within-subject experiment, this allowed to control for differences in content familiarity and the transfer of task content. This report investigates the experiment and resulting data as part of a larger research project, other variables investigated in the process questionnaire are personality traits and creative self-efficacy, among others.

4.1.1 Subjects

The participants of this experiment were students, recruited from the University of Twente. The participation was voluntary and had no association with academic performance to exclude extrinsic motivation as a random effect. The BMS Ethics Committee of the University of Twente has reviewed and approved the research project. All participants had to give informed consent about the data collection- and processing methods.

4.1.2 Treatments

When starting the experiment, the subjects were randomly divided into three groups, determining the treatment they received according to the three exploratory conditions: identified-, anonymous-, and selectively anonymous ideation.
In the identified treatment, while receiving the idea generation task, the subjects were informed that after an idea evaluation ranking process, all information resulting from the task would be revealed in a digital learning environment that all subjects shared. The subjects were reminded that this included the description, rank and evaluation score, and idea creator name of all generated ideas. The identified treatment information, as displayed to the group can be found in the appendix, §A.1.
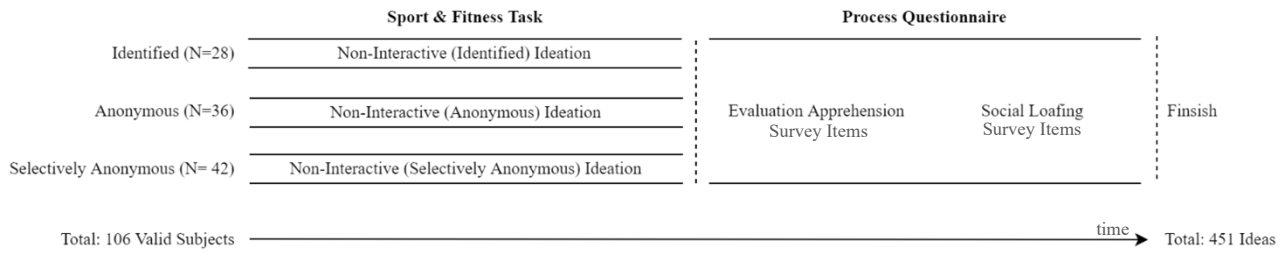
Figure 2. Experimental Design over time

In the anonymous treatment, upon receiving the idea generation task, students were informed that after an anonymous idea evaluation ranking process, no information from this round would be revealed in the shared digital learning environment. The subjects were reminded that the description, rank, evaluation score, and idea creator name of all generated ideas would remain undisclosed. The anonymous treatment information, as displayed to group members, is to be seen in the appendix, §A.2.

Lastly, in selective anonymity, when receiving the idea generation task, the subjects were informed that after an anonymous idea evaluation ranking process, no information from this round of brainstorming would show for most ideas. Only the ideas ranking best would be disclosed with respect to the description, rank and evaluation score, and idea creator name of the best generated ideas. The selectively anonymous treatment information, as displayed to group 3, can be found in the appendix, §A.3.

4.1.3 Ideation Task

The experiment was conducted in a web-based interface, which guided the subjects through the research design. Before giving informed consent, students were informed that the study entailed a creative idea generation task. The experiment was composed of two sections, starting with a creative idea generation session lasting five to ten minutes. After being assigned into a group, all subjects across treatments faced the same task description, along with 10 dedicated text boxes to enter idea descriptions. The task description reads as follows:

You have been retained by a manufacturer of sports and fitness products to identify new product concepts for the student market. The manufacturer is interested in any product that might be sold to students in a sporting goods retailer. The manufacturer is particularly interested in products likely to be appealing to students. These products might be solutions to unmet needs or improved solutions to existing needs. Please come up with ideas for new product concepts in the field of sports and fitness products for the student market.

The ideation task was followed by a process questionnaire to investigate the subjects' perceptions of the underlying social dynamics of the prior idea generation process. Before moving to the process questionnaire though, a filter question was included to validate the subjects' understanding of the assigned treatment. Participants were asked to what degree their generated content and identities would be shared after submission. Subjects who responded inconsistently with their assigned treatment have been removed from the data set, leaving 106 valid subjects. In the questionnaire, they were asked to what extent they agreed or disagreed with 8 statements regarding their behavioral characteristics displayed during the ideation sequence. The first four items were dedicated to evaluation apprehension, and the latter four investigated social loafing. The items were constructed by Dr. Schweisfurth, who constructed them on 7-point Likert scales, ranging from 'strongly disagree' to 'strongly agree'. Figure 2 illustrates the entire experimental design over time.

4.2 Measuring Ideation Performance

To measure how good a given idea is, Amabile's (1983) Consensual Assessment Technique is applied. For that, a rater panel of seven International Business Administration undergraduates has been established. All seven raters know the research project in the context of their dissertations and are independent of the subjects involved in the experimental stage of this research. Based on higher education in the domains of marketing, innovation, and consumer behavior, the panel qualifies sufficiently as a group of domain experts. Ideas were rated in a random order, irrespective of case treatments. All raters rated all ideas individually, using a virtual environment in which the generated product concept descriptions were provided. The panel was tasked not to rate unclear product concepts or product concepts which do not fit the task description, on any of the dimensions. Concepts that were not rated by the majority of raters for any of the three dimensions, were declared invalid ex-post. After that, the statistical inter-rater agreement among the panel members have been determined using Cronbach's Alpha. The remaining ideas were ranked within their groups, after which the data was reduced to only the best generated ideas per performance metric. Respectively, data clusters were established per treatment.

4.2.1 Operationalizing Ideation Performance

To rate Ideas based on Novelty, the panel members were tasked to assess whether there are no comparable alternatives to a product concept on a 7-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. Due to the very small sample size of only the best ideas, the cases were assessed on the idea rating level. After filtering out invalid cases through majority rating as described above, the construction of Cronbach's Alpha for the seven items suggests excellent inter-rater reliability (α = .861) for the 7-point Likert scale. Mean novelty ratings per idea were constructed for all cases, based on the novelty ratings provided per idea. The ten most novel ideas per treatment have been used for the analysis. However, all ideas tying in rank for tenth or better were considered. 10 cases from the anonymous treatment, 11 cases from the identified treatment, and 15 cases from the selectively anonymous treatment remained. This brings forth 36 cases for further analysis, with a total number of 242 ratings. Table 2 displays the distribution of the most novel ideas across treatments.

Table 2. Most novel ideas across treatments

Treatment	N Ideas	% Ideas	N Ratings	% Ratings
Anonymous	10	27.77	67	27.68
Identified	11	30.56	73	30.17
Selectively Anonymous	15	41.67	102	42.15
Total	36	100.00	242	100.00

For business value, the panel assessed whether a product concept inherits commercialization potential on another 7-point Likert scale. Again, the cases were assessed on the idea-rating level to adjust for normality. After filtering out invalid cases, Cronbach's Alpha was found to be low ($\alpha = .558$). This suggests numerous cases with insufficient inter-reliability among the raters. To improve the reliability of the ratings, all cases for which the inter-rater variance of business value was 2.2 or greater have been discarded. This means that ideas rated inconsistently by the panel are ignored. Doing so increased Cronbach's Alpha for the seven items ($\alpha = .724$) sufficiently to be considered acceptable. The pool of ideas was reduced to 287 total ideas for the analysis of business value. The selection of the best generated ideas per group, with respect to business value, turned out to be unaltered by the sample adjustment. Applying the same tie rank system as before, 13 cases from the anonymous treatment, 13 cases from the identified one, and 14 cases from the selectively anonymous one remained for further analysis. This leaves 40 ideas across the treatments, which in total have been rated 267 times. Table 3 displays the sample distribution across treatments.

Table 3. Ideas with the highest Business Value across treatments

Treatment	N Ideas	% Ideas	N Ratings	% Ratings
Anonymous	13	32.50	90	33.71
Identified	13	32.50	83	31.08
Selectively Anonymous	14	35.00	94	35.21
Total	40	100.00	267	100.00

Since the panel consists of students, the members are in a good position to rate their Purchase Intent. To do so, the raters were tasked to assess whether they would purchase the product concept on a 7-point Likert scale. Invalid cases were filtered out according to majority rating, but the construction of Cronbach's Alpha once again suggested poor inter-rater reliability($\alpha = .520$). Although purchase intent is a subjective measure in nature, the relatively small size of the rater panel does not suffice to assume a diverse composition similar to the true market without adjustment. Accordingly, all cases with a purchase intent inter-rater variance of 2.2 or greater have been discarded for the analysis. In doing so, the number of total ideas was reduced to 205. The reconstruction of Cronbach's Alpha after the adjustment suggests acceptable inter-rater agreement ($\alpha = .764$) for further analyses. The mean consumer purchase intent rating was then constructed out of four to seven purchase intent ratings per idea. The selection of the ten best generated ideas was affected as one case, ranking among the top ten ideas in the anonymous treatment, was filtered out due to inter-rater disagreement. Applying the tie rank system, 10 cases from the identified treatment, 10 cases from the anonymous treatment, and 11 cases from the selectively anonymous treatment remained. This results in a total number of 31 cases across treatments that have been rated a total number of 207 times. Table 4 presents the sample distribution across treatments.

Table 4. Ideas with the highest purchase intent across treatments

Treatment	N Ideas	% Ideas	N Ratings	% Ratings
Anonymous	10	32.26	67	32.37
Identified	10	32.26	67	32.37
Selectively Anonymous	11	35.48	73	35.26
Total	31	100.00	207	100.00

4.3 Operationalizing Evaluation Apprehension

Evaluation apprehension per subject was operationalized in the process questionnaire of the experiment. Again, a set of 7-point Likert Scales was created. The four items were formulated to determine the withholding of ideas due to social constraints during the prior idea generation stage. Appendix §A.5 presents the survey items as displayed to the participants. The validity was assessed through Principal Component Analysis, which resulted in a sufficient Kaiser-Meyer-Olkin Value of .635 and a significant Bartlett sphericity test ($p < .001$). While all items display moderate to high inter-correlations. This indicates that the four items successfully measure the same concept of evaluation apprehension. A mean score has been constructed out of the four scores to determine evaluation apprehension per respondent. The 106 subjects, who passed the filter question regarding the assigned treatment were considered. Their distribution across the three treatments can be seen in Table 5.

Table 5. Overall distribution across treatments

Treatment	N Respondents	% Respondents
Anonymous	36	33.96
Identified	28	26.42
Selectively Anonymous	42	39.62
Total	106	100.00

4.4 Operationalizing Social Loafing

Like Evaluation Apprehension, social loafing has been operationalized through a set of survey items in the process questionnaire of the experiment. The same structure of 7-point Likert scales was dedicated to investigating the degree to which participants perceived their ideation contribution. Since the concept of social loafing can be interpreted as undesirable social behavior, the items were reversed to reduce acquiescence bias. Meaning a form of response bias in which subjects tend towards positive responses unproportionly frequent. The list of items as displayed to the subjects can be found in the appendix, §A.6. Principal Component Analysis determined a sufficient Kaiser-Meyer-Olkin Value of .670 and Bartlett's sphericity test resulted as significant ($p < .001$). The four items inter-correlate moderate to high, indicating that all 4 items successfully measure social loafing. The data has been reversed for further analysis; higher social loafing scores thus indicate a higher tendency towards social loafing. The mean social loafing score has been constructed out of the four inversed scores to determine social loafing per respondent. Analyses. The same 106 subjects were considered for the analyses of both social dynamics, the respective distribution across treatments is shown in Table 4.

5. DATA ANALYSIS & RESULTS

Hypotheses H3 and H4 regarding the effect of different degrees of anonymity on performance are investigated on rating level using the three dependent variables separately. This is done first to determine whether the mediation hypotheses H1 and H2 can be investigated as anticipated. Unless stated otherwise, I use the One-Way Analysis of Variance (One-way ANOVA) of these statistics to determine whether significant relationships exist between the treatment received and the respective performance metrics. A 90% Confidence Interval is applied, due to the limited sample size. The assumptions for One-way ANOVA regarding population normality and sample independence are fulfilled due to the nature of the data gathering process as described in the research design section.

Table 6.
One-way ANOVA Results comparing the three Treatments for each of the Dependent Variables.

Discussion section	Statistic compared	N	Mean [Anonymous]	Mean [Identified]	Mean [Selectively Anonymous]	F-statistic between Groups	Mean difference: [A-SA] (t-statistic)	Mean difference:[I-SA] (t-statistic)
6.1	Performance of best generated ideas							
6.1.1	Novelty[a] (1-7 scale)	242	5.340	5.405	5.221	.612	.119 (.735)	.184 (1.054)
6.1.2	Business Value[a] (1-7 scale)	267	5.489	5.298	5.420	2.761*	.069 (.850)	-.122 (-1.511)
6.1.3	Purchase Intent[a] (1-7 scale)	207	4.975	4.646	5.056	18.150**	-.081 (-1.139)	-.410** (-5.745)
6.2	Social Dynamics							
6.2.1	Social loafing (1-7 scale)	106	3.535	3.196	3.583	1.376	-.049 (-.213)	-.387 (-1.577)
6.2.2	Evaluation Apprehension (1-7 scale)	106	2.722	3.259	3.179	1.885	-.456 (-1.623)	.080 (.266)

[a]The unit of analysis is *idea rating*
*$p < 0.1$; **$p < 0.001$

Levene's tests across the treatment groups resulted as non-significant, indicating that the equality of variances may be assumed The idea performance metrics are measured on a continuous scale. Using this method of analysis allows for the statistical comparison of all three treatments through *F*-scores, as well as for the statistical comparison between all three pairs of treatments through *t*-statistics. One-Way ANOVA will also be used to investigate the effects of the received treatment on the underlying social dynamics of evaluation apprehension and social loafing. In either case, the explanatory variable is treatment. The test group is the one that received the treatment in selective anonymity, which is assessed against the two control groups which received the anonymous or identified brainwriting treatments. Lastly, the social dynamics' implications for ideation performance are determined. The data analysis procedure for which is explained in detail in section 5.3.

Table 6 illustrates the results and depicts the discussion section per topic. A star (*) in the header throughout the result section indicates that empirically significant results have been found according to the determined α-value of 0.1.

5.1 Degree of Anonymity on the Performance of the Best Ideas

Table 6 on the following page initiates the empirical results section. Row 6.1 displays the scores of the best-rated ideas among the three treatment groups concerning idea generation performance. The following sections disseminate the results with respect to each of the performance measures.

5.1.1 Degree of Anonymity on Novelty

Table 6, row 6.1.1, compares the most novel ratings of the selectively anonymous test group with both control groups. After determining the empirical significance of differences between means, I conclude that there is **insufficient evidence** to determine a significant difference between any of the three treatments ($F(2, 239) = .612$, $p = .543$). The selectively anonymous group's most novel ideas ($M = 5.221$, $SD = 0.506$) score about the same as the anonymous group ($M = 5.340$, $SD = .449$) and the identified group ($M = 5.405$, $SD = .300$). The differences in means across treatments in novelty scores ("NOV"), but also in Business Value and Consumer Purchase Intent ("PI") are visualized in figure 3. Hypothesis H1 assumed that the best generated ideas are better in the selectively anonymous ideation process than in identified ideation for the

three performance dimensions. In terms of Novelty, the experiment revealed no significant differences between the treatment groups, as the best ideas were rated the same by the panel. The same goes for Hypothesis 2 arguing selective anonymity produces better outcomes than anonymity. This already leads to the partial rejection of both Hypotheses, as novelty has been found insignificant
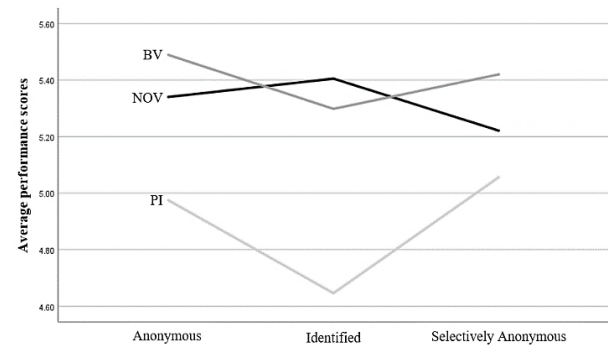

Figure 3. Mean Performance scores across treatments

Degree of Anonymity on Business Value*

Table 6, row 6.1.2, assesses the differences in the highest business value ratings of the test- and control groups. Analyzing the variances between subgroups allows me to conclude that there is sufficient evidence to determine **significant** differences among the treatments ($F(2, 264) = 2.761$, $p = .076$). The test group's best rated ideas with respect to business value ($M = 5.420$, $SD = .210$) score almost the same as the anonymous group ($M = 5.489$, $SD = .206$) and the identified group ($M = 5.298$, $SD = .216$). There is however a score difference in-between the two control groups. The best ideas generated concerning Business value turn out to be .191 rater units higher among the anonymous group, which is statistically significant at a 90% Confidence Interval ($t(171) = -2.319$, $p = .026$). Hypotheses H1 and H2 also hypothesized business value to be rated better among the best generated ideas of selective anonymity over the test groups. While the hypotheses are to be rejected, the empirical analysis provided new insights. Namely the statistical difference between anonymity and identification. statistically underlining the superiority of the anonymous process over the identified one in a new context.

5.1.2 Degree of Anonymity on Purchase Intent *

Table 6, row 6.1.3, contrasts the highest purchase intent ratings of the selectively anonymous treatment with both traditional ones. The empirical analysis leads to my conclusion that the treatment has a **significant** effect on the quality of the best ideas generated with respect to consumer purchase intent ($F(2, 204) = 18.150$, $p < .001$). When closely assessing the magnitude of this effect in-between treatments, we find that the selectively anonymous group's best generated ideas ($M = 5.056$, $SD = .136$) statistically score insignificantly different, from the anonymous treatment ($M = 4.975$, $SD = .141$). However, selective anonymity scores higher than the identified treatment by .410 units ($M = 4.646$, $SD = .207$). This difference in means is statistically significant ($t(138) = -5.745$, $p < .001$). Similar to business value, I find a significant difference between the two control groups in favor of the anonymous treatment, the best ideas generated of which on average score .329 units better than those in the identified treatment ($t(132) = -4.500$, $p < .001$). Hypotheses H1 and H2 theorized the generation of product concepts with the highest consumer purchase intent in Selective Anonymity. There is insufficient evidence to conclude better purchase intent from selective anonymity over the anonymous treatment but over the identified one. Thus, there is evidence to validate parts of Hypothesis H1. This implies that the selectively anonymous ideation process provides more consumer-oriented ideas than the most common brainwriting method. Furthermore, I find statistically better performance in the anonymous method over the identified one in this new setting.

5.2 Degree of Anonymity on the Social Dynamics

Table 6, row 6.2 and after, presents the observed values for the underlying social dynamics of social loafing and evaluation apprehension among the three groups. According to this, figure 4 displays the mean social dynamic scores across treatments.

5.2.1 Degree of Anonymity on Social Loafing

Table 6, row 6.2.1, displays the mean social loafing scores among the three treatments as well as the respective mean differences between the test group and both control groups. After conducting ANOVA, I conclude that there is **insufficient evidence** to determine significant differences in free-riding between the three treatments ($F(2, 103) = 1.376$, $p = .257$). The selectively anonymous group ($M = 3.583$, $SD = .937$) scores the same as the anonymous group ($M = 3.535$, $SD = 1.148$) and the identified group ($M = 3.196$, $SD = .904$). Hypothesis H3 suggested social loafing as a mediator of idea generation performance. However, the absence of a significant effect of the received treatment on the perceived social loafing requires me to reject this based on the empirical findings.
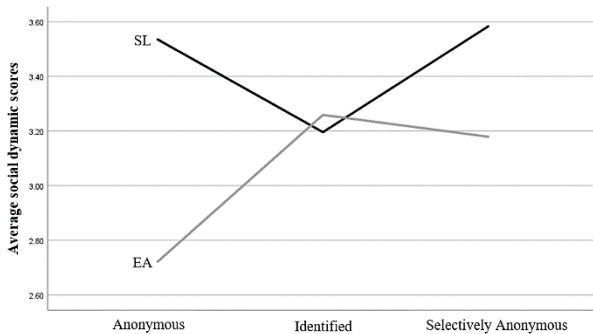

Figure 4. Social Dynamic scores across treatments

5.2.2 Degree of Anonymity on Evaluation Apprehension

Table 6, row 6.2.2, compares the mean differences in evaluation apprehension measured between the test and control groups. The same 106 observations are used as for social loafing. After analyzing the data, I conclude **insufficient evidence** to assume an effect between the treatment and evaluation apprehension ($F(2, 103) = 1.885$, $p = .157$). Outputs from the Selectively anonymous treatment ($M = 3.179$, $SD = 1.209$) are the same for both the anonymous treatment ($M = 2.722$, $SD = 1.240$) and for the identified one ($M = 3.259$, $SD = 1.279$). While the marginal differences imply that the identified treatment scores are significantly higher than the anonymous one, namely by .537 scale units ($t(72) = -1.720$, $p = .088$), the coefficient does not determine so due to the failure of finding significance for the respective F-statistic. Hypothesis H4 assumed evaluation apprehension as a mediator on the idea generation performance dimensions. But due to the insignificant relationship between the treatment received on the evaluation apprehension perceived, this hypothesis as a whole is rejected.

5.3 Social Dynamics on the Performance of the best Ideas per Subject

This experiment provides insufficient evidence to validate the underlying social dynamics as mediators, due to the absence of direct effects originating from the degree of anonymity. However, the conceptual framework still the social dynamics to negatively affect idea generation performance. Here, I report the main findings for both social dynamics on all performance metrics using multiple linear regression. Where individual coefficients are found to be insignificant, model reduction to single linear regression is conducted. Evaluation apprehension and social loafing have been measured once per subject, but each subject submitted multiple ideas. Accordingly, the best ideas per performance dimension have been selected per subject to run the regressions. This way, the best ideas per participant are considered and the extreme value logic is maintained. The Regression output tables can be found in Appendix, §A.7.

5.3.1 Social Dynamics on Novelty *

When calculating a multiple regression to predict Maximum Idea Novelty per subject based on Evaluation Apprehension and Social Loafing, no significant regression equation was found ($F(2, 103) = 2.126$, $p = .125$, $r^2 = .040$). When analyzing the predictors, we find insignificant contribution of evaluation apprehension ($t(104) = .685$, $p = .495$), but a statistically significant contribution of social loafing ($t(104) = 2.022$. $p = .046$) as a predictor of idea novelty. After reducing to a single linear regression to predict maximum idea novelty only based on social loafing, a new **significant** equation is found ($F(1, 104) = 3.801$, $p = .054$, $r^2 = .035$). This states the following:

$$Y_1(Max\ Novelty) = 4.729(Constant) - .213x_1(Social\ Loafing)$$

Hence, the rater panel's average novelty rating of the best idea per subject decreases by .213 rater units for each unit of social loafing responded by the subjects.

5.3.2 Social Dynamics on Business Value *

In order to predict Maximum Idea Business Value per subject based on Evaluation Apprehension and Social Loafing, multiple regression was calculated. The findings of which indicate a **significant** regression equation ($F(2, 103) = 7.280$, $p = .001$, $r^2 = .124$). Both predictors have been found to be significant ($t_{ea}(103)$

$= -1.894$, $p_{ea} = .061$; $t_{sl}(103) = 3.013$, $p_{sl} = .003$), resulting in the following regression equation:

$$Y_2(Max\ Business\ Value) = 5.644(Constant) - .147x_1(Social\ Loafing) - .075x_2(Evaluation\ Apprehension)$$

Thus, the average business value rating of the best idea per subject decreases by .075 rater units for each unit of evaluation apprehension and by .147 rater units for each unit of social loafing indicated by the respondents, respectively.

5.3.3 Social Dynamics on Purchase Intent *

Lastly, multiple regression was applied to predict Maximum Idea Purchase Intent per subject based on Evaluation Apprehension and Social Loafing. While this results in a significant regression equation ($F(2,103) = 4.158$, $p = .018$, $r^2 = .075$), evaluation apprehension is found not to contribute significantly to the regression model ($t(103) = -.805$, $p = .423$), while social loafing is found to do so ($t(103) = 2.628$, $p = .010$). After running single linear regression to predict maximum idea purchase intent only from social loafing, the new regression equation is found to be **significant** ($F(1,104) = 7.694$, $p = .007$, $r^2 = .069$).

$$Y_3(Max\ Purchase\ Intent) = 4.739(Constant) - .161x_1(Social\ Loafing)$$

This suggests the maximum purchase intent rating of the best rated idea per subject to decrease by .161 rater units for each unit of social loafing indicated by the participant.

6. DISCUSSION
6.1 Summary

This paper aims to determine the effects of different degrees of anonymity in the creative ideation process, applying the extreme value logic. Ideation performance was conceptualized as a multidimensional construct, of which the underlying output metrics of novelty, business value, and consumer purchase intent have been measured. The analyses of this paper find that the anonymous treatment scores better than the identified one in business value and consumer purchase intent, facilitating its theorized superiority. Selective Anonymity scores best in the consumer purchase intent dimensions, providing limited but promising evidence for the potential of the new method. The underlying social dynamics of evaluation apprehension and social loafing were empirically unaffected by different degrees of anonymity. However, they were found to be predictors of performance. Respectively, evaluation apprehension was found to be a predictor of business value, while social loafing has been determined to be a predictor of all three performance dimensions.

6.2 Theoretical Implications and Future Research

This section will tie in the findings into existing literature and discuss the hypothesized relationships on the applied social dynamics and performance metrics.

6.2.1 Insights on Ideation Performance

The literature on idea novelty in anonymous settings is mixed. Just as in my findings, Zhou et al. (2019) found no measurable effect between evaluation apprehension on novelty. Connolly et al. (1990) validated a relationship between computer mediation on novel ideation. Given, however, that all three treatments were conducted virtually and hence are assumed to score the same in this research project, this implies no clear

improvement. Lastly, Chang et al. (2011) found a significant negative effect of virtual teams with structured anonymity on idea novelty. Apart from the effect of social loafing on novelty, this research project was unable to validate or devaluate historic findings regarding the determinants of idea novelty. This once more highlights the complexity of novel ideation. However, this research also did not provide any evidence of a negative role of anonymity in the prediction of novelty. The inconclusiveness continues the need to research this topic, given the pressing need for novel value creation in innovation.

Business Value is the metric that relates closest to Idea Quality in this business context as iterated by numerous scholars before. As a measure of performance, it is frequently used in the context of anonymous ideation. Connolly et al. (1990) did not find a relationship between anonymity and idea quality in such context, while Chang et al. (2011) did so in a case study. Combining the theoretical assumption of better quality in anonymous settings with Girotra et al.'s (2011) extreme value logic on innovation ideation and the respective performance conceptualization, this research provides new insights into the quality of the best idea in anonymous ideation. In doing so this project is contributing to the anonymous ideation literature in a setting that is unique concerning the experimental design and performance conceptualization.

Purchase intent as a measure of performance has already been validated by comparing hybrid and team methods by Girotra et al. (2011). Other than that, there is generally little evidence in either ideation technique assessed in this research. In this sense, this research provides novel insights regarding forms of anonymity. The results display the potential that selective anonymity may hold, resulting in limited but promising evidence of the method. Furthermore, anonymity has been validated in providing more consumer-oriented business concepts than the identified setting, filling a research gap on this specific performance metric in the anonymity literature.

6.2.2 The Role of Social Loafing

Concerning the mediating role of social loafing on performance in ideation, Muzafary et al. (2021) found the public acknowledgment of extraordinary task efforts to significantly decrease social loafing. Given that this research found no significance, the question is raised why the findings differ. The recency of the paper implies that virtual environments were already designed to cope with social restrictions due to the global pandemic and the virtual environment used appears similar. The difference may lie in the nature of the laboratory experiment. Muzafary and Colleagues investigated rewards' effects on creativity, which was not measured as an output metric of ideas but observed in the subjects' behavior. On the other hand, it may be that the intrinsic reward promised to the subjects in this experiment was not attractive enough to affect the ideation process, as the social comparison between subjects did not happen in person throughout the COVID-19 pandemic. In a computer-mediated setting, McLeod (2011) found that the effect of identified rewards on idea generation performance was insignificant for the idea performance metrics of creativity and feasibility. This raises the question of whether the one-time provision of an intrinsic reward has the same effect on ideation behavior as numerous intrinsic rewards provided over a longer period. Or, whether selective anonymity with integrated social comparison mechanisms would score better if rewards were provided and compared in person?

Lastly, addressing the prediction ability of social loafing in ideation, this research facilitates the general assumption that social loafing reduces performance. The findings on all three performance metrics agree with the consensus established in the field beforehand (Chang et al., 2011; McLeod, 2011), confirming

social loafing as one of the central stimulants of productivity loss in the field.

6.2.3 The Role of Evaluation Apprehension

Similar to how the findings on social loafing in a new setting question prior insights on behavior in ideation, the findings on evaluation apprehension partially disagree with historic assumptions on evaluation apprehension. Many social situations imply increased perceived evaluation apprehension, the more people interact in a group (Collaros & Anderson, 1969). Given, however, that the experiment has been conducted online and without in-person interaction, evaluation apprehension is argued to be already reduced by Chang (2011) and Girotra et al. (2011). In terms of empirical evidence, Galluppe et. al. (1992) determined a negative relationship between computer-mediation and evaluation apprehension.

In terms of the prediction of performance through evaluation apprehension, it is to be considered that team members only socially compared ex-post in a virtual learning platform. It is unclear whether the perception of social dominance and the counterreaction of social anxiety truly occurred among the participants. Hence it is questionable whether original brainstorming insights even still apply to virtual ideation methodology. Chang (2011) empirically determines evaluation apprehension to predict idea quality in virtual teams. This is confirmed in this research due to the negative prediction of business value, as discussed, a related measure of idea quality in business settings. The direct effect of anonymity on evaluation apprehension in computer-mediated settings is also argued to be dependent on the delicacy of the task content by McLeod (2011). In this context, the generation of business concepts for a sport and fitness retailer can only selectively be argued as sensitive in nature. This opens up the door to investigate task content sensitivity as a moderator of evaluation apprehension in computer-mediated ideation.

6.3 Practical Recommendations

Based on the findings, there are several implications to be drawn for the ideation process in product innovation. The focus should lie on carefully abandoning identified brainwriting in creative ideation, which to this day is a frequently applied method in professional settings. The insights of this research contribute to the assumption that the anonymous brainwriting procedure provides better output than the identified one. The empirically supported suggestion, that anonymity has a positive effect on output metrics, demonstrates the superiority of anonymity when consumer-oriented solutions with high market potential are needed. In professional environments, these are two product dimensions of central importance. There is no empirical evidence for or against more novel ideas, that are pressingly needed in innovation. Concerning purchase intent, selective anonymity establishes itself as statistically better than the identified approach, however, the method is insufficiently researched to be considered superior to the anonymous ideation process. Hence, it is the responsibility of innovation managers to critically question current ideation procedures. Not observing social constraints as expected in different degrees of anonymity implies that the social phenomena of evaluation apprehension and social anxiety are indeed reduced in virtual settings, providing managers with helpful insights into counteracting them. On the other hand, this paper raises the critical question regarding whether free-riding can be reduced in electronic settings. In this sense, the absence of limiting factors traced back to anonymity in this research encourages professionals to experiment with different factors in virtual settings.

6.4 Limitations

While the study provides numerous valuable insights into different degrees of anonymity, all hypotheses have been rejected. To provide a better overview of the tests conducted, the three dependent performance metrics were combined into a single hypothesis, leading to the partial rejection of direct effects. Less clear is the inability to validate an effect between different degrees of anonymity on the underlying social dynamics. While the absence of an effect on evaluation apprehension can be explained coherently with historic scholars due to the insufficient interaction in-person, anonymity in ideation literature is covered to date and applicable virtually. A potential explanation for the absence of an effect may be that social loafing was measured as perceived by the subjects, rather than as a behavior. The latter would have been less obtrusive, the adjustment for perception bias through an inverse questionnaire thus might have been insufficient. While the generated idea quantity per subject was measured, this is not a reliable indicator for task effort. It is important to mention that this paper has been written as part of an undergraduate research project, restricting the choice of performance metrics concerning the diversity of research objectives across the project members. Lastly, it is questionable to which degree the results of this laboratory experiment among students at a Dutch university are applicable in a global and professional context, calling for a case study in a more precise innovation context.

7. CONCLUSION

Recall that this research paper aims at answering the following research question, as stated in the introduction:

What is the effect of different degrees of anonymity on the idea generation performance of the best generated Ideas among students in the computer-mediated brainwriting process?

After testing the central hypotheses concerning three dependent variables and mediating social phenomena, it appears that the implementation of anonymity in the virtual ideation process provides better results. This is empirically supported for business value and consumer purchase intent, two metrics of high importance for successful product development. No implications can be made about the novelty of generated ideas. The findings of this paper contribute to facilitating the theoretical superiority of anonymous brainwriting over the identified method. The latter is to this day the most well-known procedure, arguably due to convenience and position as a long-term best practice. Furthermore, this paper established selective anonymity in ideation. The initial findings suggest superiority over identified practices concerning consumer purchase intent. But the findings do not imply increased performance over the anonymous method, questioning whether it indeed inherits more excellent ideas. Furthermore, given that the selectively anonymous process requires additional software support to guarantee non-disclosure throughout the ideation and rating phase, it is questionable whether selective anonymity is already a viable alternative to anonymity. Given that the mediating roles of evaluation apprehension and social loafing are found insignificant, it is unclear why selective anonymity is truly able to outperform the identified method, although they are most certainly to be considered as independent predictors. This leaves the question of why and to what degree selective anonymity is a long-term improvement for future scholars. Either way, the research conducted validates that different degrees of anonymity indeed have a significant effect on selected ideation performance metrics beyond the implementation of total anonymity.

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9. APPENDIX

§A.1: Anonymous Treatment description

- If you provide ideas, your ideas will be evaluated and ranked anonymously.
- After the evaluation, **NO information** from this brainstorming challenge **will be revealed** to other participants, i.e.
  - The description of each idea will **not be revealed.**
  - The overall rank and evaluation score of each idea will **not be revealed.**
  - The name of each idea's creator will **not be revealed.**

§A.2: Identified Treatment description

- If you provide ideas, your ideas will be evaluated and ranked anonymously.
- After the evaluation, **ALL information** from this brainstorming challenge **will be revealed** to other participants, i.e.
  - The description of each idea **will be revealed.**
  - The overall rank and evaluation score of each idea **will be revealed.**
  - The name of each idea's creator **will be revealed.**

§A.3: Treatment 3 explanation

- If you provide ideas, your ideas will be evaluated and ranked anonymously.

- After the evaluation, **information** from this brainstorming challenge **will be revealed** to other participants **only if the idea ranks among the top 10% of all ideas**, i.e.

- The description of each idea **will be revealed only if the idea ranked among the top 10%** .
- The overall rank and evaluation score of each idea **will be revealed only if the idea is ranked among the top 10%.**
- The name of each idea's creator **will be revealed only if the idea is ranked among the top 10%.**

§A.4: Ideation task description

Your brainstorming task

You have been retained by a **manufacturer of sports and fitness products** to identify **new product concepts for the student market**. The manufacturer is interested in any product that might be sold to students in a sporting goods retailer. The manufacturer is particularly interested in products likely to be appealing to students. These products might be solutions to unmet needs or improved solutions to existing needs.

Please come up with ideas for new product concepts in the field of **sports and fitness products for the student market**.

§A.5: Evaluation Apprehension Survey Items

Please answer the following questions.

Please indicate to what extent do you agree to the following statements.

	I fully DISagree.						I fully agree.
During the brainstorming, ...							
I felt apprehensive and uneasy generating and sharing ideas.	○	○	○	○	○	○	○
I was not at ease during the idea generation.	○	○	○	○	○	○	○
I was worried that others would criticize my ideas.	○	○	○	○	○	○	○
I didn't express all of my ideas because I didn't want others to think I was weird or crazy.	○	○	○	○	○	○	○

§A.6: Survey Items SL

Please indicate to what extent do you agree to the following statements.

	I fully DISagree.						I fully agree.
During the brainstorming, ...							
I feel I participated a great deal in this idea generation session.	○	○	○	○	○	○	○
I am satisfied with my own performance on this task.	○	○	○	○	○	○	○
I was very motivated to generate quality ideas.	○	○	○	○	○	○	○
I really took this task seriously.	○	○	○	○	○	○	○

§A.7.1: Multiple Regression Output on Maximum Idea Novelty per subject

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.199[a]	.040	.021	1.13095

a. Predictors: (Constant), evaluation_apprehension_mean, freeriding_mean
b. Dependent Variable: Max average novelty rating

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.437	2	2.719	2.126	.125[b]
	Residual	131.742	103	1.279		
	Total	137.179	105			

a. Dependent Variable: Max average novelty rating
b. Predictors: (Constant), evaluation_apprehension_mean, freeriding_mean

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.580	.451		10.160	.000
	freeriding_mean	-.223	.110	-.197	-2.022	.046
	evaluation_apprehension_mean	.061	.089	.067	.685	.495

a. Dependent Variable: Max average novelty rating

§A.7.2: Single Regression Output on Maximum Idea Novelty per subject

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.188[a]	.035	.026	1.12806

a. Predictors: (Constant), freeriding_mean
b. Max average novelty rating

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.837	1	4.837	3.801	.054[b]
	Residual	132.343	104	1.273		
	Total	137.179	105			

a. Dependent Variable: Max average novelty rating
b. Predictors: (Constant), freeriding_mean

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.729	.394		12.017	.000
	freeriding_mean	-.213	.109	-.188	-1.950	.054

a. Dependent Variable: Max average novelty rating

§A.7.3: Multiple Regression Output on Maximum Idea Business Value per subject

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.352[a]	.124	.107	.49936

a. Predictors: (Constant), evaluation_apprehension_mean, freeriding_mean
b. Dependent Variable: Max average business value rating

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.631	2	1.815	7.280	.001[b]
	Residual	25.684	103	.249		
	Total	29.315	105			

a. Dependent Variable: Max average business value rating
b. Predictors: (Constant), evaluation_apprehension_mean, freeriding_mean

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	5.644	.199		28.357	.000
	freeriding_mean	-.147	.049	-.281	-3.013	.003
	evaluation_apprehension_mean	-.075	.039	-.176	-1.894	.061

a. Dependent Variable: Max average business value rating

§A.7.4: Multiple Regression Output on Maximum Idea Purchase Intent per subject

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.273[a]	.075	.057	.60104

a. Predictors: (Constant), evaluation_apprehension_mean, freeriding_mean
b. Dependent Variable: Max average purchase intent rating

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.004	2	1.502	4.158	.018[b]
	Residual	37.209	103	.361		
	Total	40.213	105			

a. Dependent Variable: Max average purchase intent rating
b. Predictors: (Constant), evaluation_apprehension_mean, freeriding_mean

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.832	.240		20.171	.000
	freeriding_mean	-.154	.059	-.252	-2.628	.010
	evaluation_apprehension_mean	-.038	.047	-.077	-.805	.423

a. Dependent Variable: Max average purchase intent rating

§A.7.5: Single Regression Output on Maximum Idea Purchase Intent per subject

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.262[a]	.069	.060	.60003

a. Predictors: (Constant), freeriding_mean
b. Dependent Variable: Max average purchase intent rating

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.770	1	2.770	7.694	.007[b]
	Residual	37.443	104	.360		
	Total	40.213	105			

a. Dependent Variable: Max average purchase intent rating
b. Predictors: (Constant), freeriding_mean

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.739	.209		22.640	.000
	freeriding_mean	-.161	.058	-.262	-2.774	.007

a. Dependent Variable: Max average purchase intent rating