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An Inner Superhero: Experiments on Information Sharing in Anonymous Virtual Communities

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In anonymous settings, the expectation of social benefits from information sharing is traditionally low, as public recognition is absent. However, numerous virtual communities witness active information exchange under anonymous aliases. This study examines the role of feedback mechanisms along with two factors — competition and social distance — on information sharing. Our experimental study, controlling reciprocity and anonymity, reveals that feedback mechanisms and reduced social distance promote information sharing, particularly positive feedback. The effectiveness of the feedback mechanism in these conditions can be explained by the self-verification theory, where sharing becomes a positive reinforcement of self-image. Our findings about information sharing offer relevant insights for firms aiming to enhance innovation and collaboration.

Keywords: Feedback, Information Sharing, Self-Verification, Social Distance, Virtual Community
JEL classification: A13, C71, D83

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1 Introduction

Knowledge is commonly regarded as a public good that can be acquired and utilized by all without compromising its accessibility to others. The Internet serves as a facilitator, enabling the dissemination and acquisition of knowledge across time and space. The virtual community (VC) emerges as a prominent online channel for procuring information, employing crowdsourcing mechanisms and personal connections among individuals who may never have met face-to-face. By exchanging information about a diverse spectrum of challenges in both their personal and professional lives, a noteworthy phenomenon surfaces: the spillover of knowledge. This phenomenon not only enhances the virtual community experience for its participants but also contributes to the overall value of the network (Chiu, Hsu, and Wang, 2006; Hsu et al., 2007). Consequently, numerous enterprises have established their own VCs, strategically leveraging collaborative information sharing to build a competitive advantage through innovation and intellectual capital (Cabrera and Cabrera, 2002; Nahapiet and Ghoshal, 1998; Wang, Sharma, and Cao, 2016).

Information sharing in VCs is voluntary, unsanctioned if absent, and not universally anticipated due to the relatively informal and relaxed environment within which they are established (Cabrera and Cabrera, 2002; Kimmerle et al., 2011). Certain factors may stimulate information sharing, while others may impede the process. For instance, the expectation of reciprocity encourages information sharing, whereas doubts about reciprocation diminish the incentive to participate (Kankanhalli, Tan, and Wei, 2005; Wasko and Faraj, 2005). Given that the knowledge to be gained is perceived as beneficial to firms' competitive advantages, understanding the driving forces behind information-sharing behaviors is of significance to both practitioners and academics.

Two main categories of factors elucidate the motivations behind information sharing. One category is rooted in individuals deriving utility from aiding others, encompassing concepts like pure altruism and the warm glow phenomenon. Pure altruism arises when individuals share driven by concern for the well-being of others, while the warm glow pertains to the enjoyment derived from the act itself (Andreoni, 1989). Another category is grounded in social exchange theory (Blau, 1964; Emerson, 1962, 1976; Homans, 1961), positing that information holders share knowledge in anticipation of reciprocal benefits. These benefits extend beyond financial compensation

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to involve trust, reputation, social approval, and social capital,[1] enabling individuals to reap benefits in the future. While altruistic incentives require no specific catalyst, social approval and social capital incentives are contingent upon public recognition of the action.

Contrary to the limited generosity often observed in experimental studies, active information sharing and participation in discussions are prevalent in many VCs that feature anonymity. To enhance our comprehension of the precise drivers of information sharing within VCs, particularly when public recognition is absent, our study explores the relationship between sharing behavior and various features commonly available in VCs. A specific feature under scrutiny is the feedback mechanism, allowing members to evaluate the contributions of their peers. We posit that this feedback mechanism provides a practical way to self-verify individuals' "good" self-image and functions as a behavioral guideline for ethical action. Through a series of laboratory experiments controlling anonymity and reciprocity, we investigate the impact of the feedback mechanism alongside two additional factors: competition and social distance.

Our findings broaden the understanding of information-sharing behavior, shedding light on the existing literature in this domain. We learn that individuals continue to derive utility when their actions are acknowledged, even when their true identities are not disclosed, and the feedback originates from strangers. We contend that self-verification offers a plausible explanation, particularly in instances where subjects cannot accrue benefits from reputation or be identified as socially approved. Therefore, feedback confirms that information sharing is a publicly endorsed behavior and sharing becomes an act of benevolence individuals undertake to reaffirm their self-image. In addition, our experimental evidence captures the detrimental effect of social distance on information sharing but cannot identify competition as a deterrent to information sharing.

[1]There are two broad definitions of social capital. Jackson, Rodriguez-Barraquer, and Tan (2012) defines social capital at an aggregate level, encompassing the total value generated among members who trust and cooperate within a social network structure, recognizing an equilibrium of ostracism and social expectations for each behavior. The other by Glaeser, Laibson, and Sacerdote (2002) defines social capital at an individual level, describing the social skills, charisma, and the size of the personal network that enables its owner to derive benefits from interpersonal interactions. The social capital to which we refer here is at the individual level.

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2 Literature review

The experimental economics literature reveals intriguing insights into human behavior within voluntary public good settings, often defying conventional theories through instances of overcontribution (Carpenter, 2007; Gintis, 2000). A significant body of research delves into the motivations underlying information sharing in the context of knowledge management. Utilizing social exchange theory and social capital theory, Kankanhalli, Tan, and Wei (2005) elucidate the decision-making process behind sharing knowledge actions. According to social exchange theory, the decision to share information emerges from a cost-benefit analysis (Blau, 1964; Emerson, 1962, 1976; Homans, 1961; Mayer and Gavin, 2005; Szulanski, Cappetta, and Jensen, 2004). The costs of sharing are consistent with a public-good dilemma and encompass the effort of making the information available, concerns of free-riders, and the potential of losing a competitive edge (Cabrera and Cabrera, 2002). Conversely, the benefits encompass extrinsic gains, such as monetary rewards, public recognition, and reciprocity, alongside intrinsic gains like knowledge self-efficacy, altruism, and warm glow (Kankanhalli, Tan, and Wei, 2005).

Numerous scholars have investigated both intrinsic and extrinsic incentives that stimulate voluntary sharing behaviors (e.g., Hung et al. (2011); Lin (2007); Marett and Joshi (2009)). Intrinsic motivation drives individuals to engage in actions they find personally fulfilling, while extrinsically motivated individuals are driven by earning utility or attaining a goal (Deci and Ryan, 1980). For instance, intrinsic incentives include pure altruism and warm glow, as detailed by Andreoni (1989, 1990), who emphasizes the utility derived from giving. This model of incentives to explain sharing behaviors is supported by experimental studies (Crumpler and Grossman, 2008).

Among extrinsic incentives, social capital stands out. Burt (2000) defines social capital as an asset obtained from holding an advantageous position in a social structure. Individuals may share in anticipation of nonmonetary rewards like strong interpersonal connections, reputation, and peer recognition (Black, 2023; Yang and Farn, 2009). Another related extrinsic incentive is social approval (Rege and Telle, 2004), where adherence to social norms stems from the desire for approval. The psychology literature further reveals the positive impact of praise on an individual's self-worth (Crocker and Wolfe, 2001; Kamins and Dweck, 1999), prompting individuals to signal their identity through prosocial behavior (Dubé, Luo, and

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Fang, 2017).

Anonymity has been identified as a deterrent to prosocial behavior. Locey and Rachlin (2015) demonstrate that prosocial tendencies are more pronounced when identities are disclosed. This effect resonates in studies of public goods contributions, with anonymity reduction leading to increased contributions (Soetevent, 2005). The reasoning for the effect is primarily attributed to the fact that the generated utilities are empowered by public reactions and opinions. As people like to be perceived favorably by others, prosocial behaviors act as social signals reflecting social preferences and maintaining a social image (Grossman, 2015). Consequently, actions driven by pride, reputation, and leadership, as well as the aversion to shame, are moderated by anonymity (Andreoni and Petrie, 2004; Reinstein and Riener, 2012).

Self-verification is the psychological process of seeking feedback, information, and interactions to reinforce an existing self-identity (Swann and Ely, 1984). Literature in behavioral economics has described concepts akin to self-verification, such as self-signaling and self-impression management, as drivers to share information and resources (Grossman, 2015; Murnighan, Oesch, and Pillutla, 2001). A person who sees herself as prosocial invests in this identity by doing good deeds (Bénabou and Tirole, 2011). Individuals conform to their self-image by engaging in actions aligned with their identity, as illustrated by Gneezy et al. (2012) who found increased altruistic giving when the prosocial behavior was a costly signal for their own self-perception. In VCs, feedback mechanisms shape individuals' self-image, which motivate them to continue participating (Zhou et al., 2019). Consequently, aligned with the self-verification theory, sharing information should assume the role of a virtuous deed, reaffirming individuals' self-image, and compelling them to engage in sharing actions in anticipation of affirming feedback.

Considering the intrinsic and extrinsic incentives of information sharing in anonymous VCs. Extrinsic incentives related to social capital diminish when individuals share under an anonymous alias that cannot be recognized. (Bénabou and Tirole, 2011; Eckel and Grossman, 1996). In the absence of a feedback mechanism to confirm their own self-image, individuals could primarily receive intrinsic incentives derived from altruism, which may not be sufficient to encourage active information sharing. Thereby, we posit that self-verification with a feedback mechanism should stimulate information sharing despite anonymity.

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H1 Feedback self-verification increases information sharing in anonymous virtual communities.

When the perceived benefits outweigh the costs, information sharing is triggered. The competitive forces as perceived by the possessor of knowledge influence the cost-benefit analysis and later the information sharing decision. Sharing information in a competitive environment augments the competing parties' capabilities at the expense of the sharer. Particularly, as Ardichvili et al. (2006) identified in China, sharing could reduce the original advantage that the sharer could have obtained by retaining information. When individuals compete for economic rewards, the extrinsic incentives are more salient and information becomes an economic exchange (Sun, Fang, and Lim, 2012). Consequently, the opportunity cost of information sharing deters information-sharing behaviors in competitive communities (Sun, Fang, and Lim, 2014). In instances where competition is not a major concern, the frequency of information sharing should increase, given that individuals do not consider the costs associated with competition.

H2 Low competition increases information sharing in anonymous virtual communities.

In economic literature, the influence of reciprocity and mutual identification on shaping giving behaviors emerges as a significant theme (Bohnet and Frey, 1999). While individuals may outwardly exhibit self-centered behaviors, their actions strategically conform with the social norm in presence of reciprocity (Fehr, Fischbacher, and Gächter, 2002). Social exchange theory could identify social capital and social approval as rewards from reciprocity. However, social cognitive theory suggests that reciprocity transcends the conventional boundaries of social exchange theory and proposes collective agency as a socially interdependent effort (Bandura, 2001). Hence, reciprocity results from the dynamic and interactive relationships with others providing the basis of trust, cooperation, and collective action in a community (Chaudhuri, Sopher, and Strand, 2002). These personal and social relationships can be influenced by the extent of intimacy between parties — a concept coined as social distance (Bogardus, 1947; Park, 1924; Simmel, 1908).

The construct of social distance comprises affective, normative, interactive, and cultural-habitual dimensions that reflect subjective feelings, norms of membership status, frequency and length of interaction, and psychocul-

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tural similarities among members, respectively (Karakayali, 2009). Notably, previous studies have found the importance of the affective nature of the relationships (Nahapiet and Ghoshal, 1998) and group identification (Chiu, Hsu, and Wang, 2006) in assessing information-sharing behaviors. Experimental economists concur that reducing the social distance among individuals promotes other-regarding behaviors of any social exchange norm (Bohnet and Frey, 1999; Locey and Rachlin, 2015). Thereby, reducing social distance in an anonymous community should foster information sharing behaviors even though the information sharer cannot individually identify the information receivers.

H3 Low social distance increases information sharing in anonymous virtual communities.

3 Experimental design

Our study investigates the effects of feedback, competition, and social distance on information-sharing behavior within an environment that permits unidirectional sharing, while controlling anonymity and non-reciprocity. The main drivers influencing information sharing are manipulated as described in Table 1. Both the quantity and quality of information shared are assessed. Subjects with information must decide whether to share true information, false information, or not share information. A between-subject design is used to prevent carry-over and demand effects, which tend to occur in within-subject designs (Charness, Gneezy, and Kuhn, 2012).

To elucidate the determinants of information sharing, five distinct treatments are implemented, as illustrated in Figure 1. Among these, four treatments exhibit high social distance — namely, treatments 1, 2, 4, and 5. Both treatment 1 and treatment 2 involve an environment with the presence of feedback. While treatment 1 has high competition, treatment 2 experiences low competition. On the other hand, treatment 4 and treatment 5 lack a feedback mechanism, with treatment 5 featuring high competition and treatment 4 presenting low competition. Treatment 3 is the only treatment with low social distance, with its subjects encountering low competition and a feedback mechanism.

In the previous section, three hypotheses were formulated for empirical examination in our study. Hypothesis 1 postulates more information sharing in the presence of a feedback mechanism for self-verification. By contrasting

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Table 1: Summary of variable manipulation

Variable	Definition	Manipulation
Feedback self-verification	The extent to which self-image is confirmed by feedback (Swann and Ely, 1984).	High: the presence of a system to accumulate feedback. Low: no feedback feature.
Competition	The rivalry between two parties due to the conflicts of interest (Sun, Fang, and Lim, 2012).	High: the fastest earns more than others Low: any person with the right answer earns the same
Social distance	The distance between two parties determined through the degree of interactivity and closeness (Karakayali, 2009).	High: random unfamiliar participants Low: all participants know each other

treatments 1 and 5, as well as treatments 2 and 4, we can elucidate the effect of feedback. Then, hypothesis 2 posits that competition hinders information sharing. By comparing treatments 5 and 4, as well as treatments 1 and 2, we can discern the effect of competition. Finally, hypothesis 3 anticipates higher information sharing when social distance is low between subjects. The differences between treatment 2 and 3 allows us to detect the effect of social distance on information sharing.

In non-anonymous scenarios, the disutility from social sanctions and the utility from maintaining a positive social image, such as social approval and social capital, induce the sharing behaviors (Fehr and Fischbacher, 2004; Kankanhalli, Tan, and Wei, 2005). In our study, public recognition is eliminated with the condition of anonymity, which removes the influence of extrinsic social incentives. Hence, we expect to capture the effect of the presence of a feedback mechanism on information sharing and discuss its influence on intrinsic incentives for self-verification.

Regarding social distance, the manipulation is implemented by varying the extent of closeness that the subjects have with other subjects. Two levels of social distance, high and low groups, are adopted. The high social distance group contains subjects who are randomly recruited to ensure that they are strangers. The low social distance group contains students who know each other well and have gathered at least a few times in the past two months before their experimental sessions. We invite four groups with close ties to

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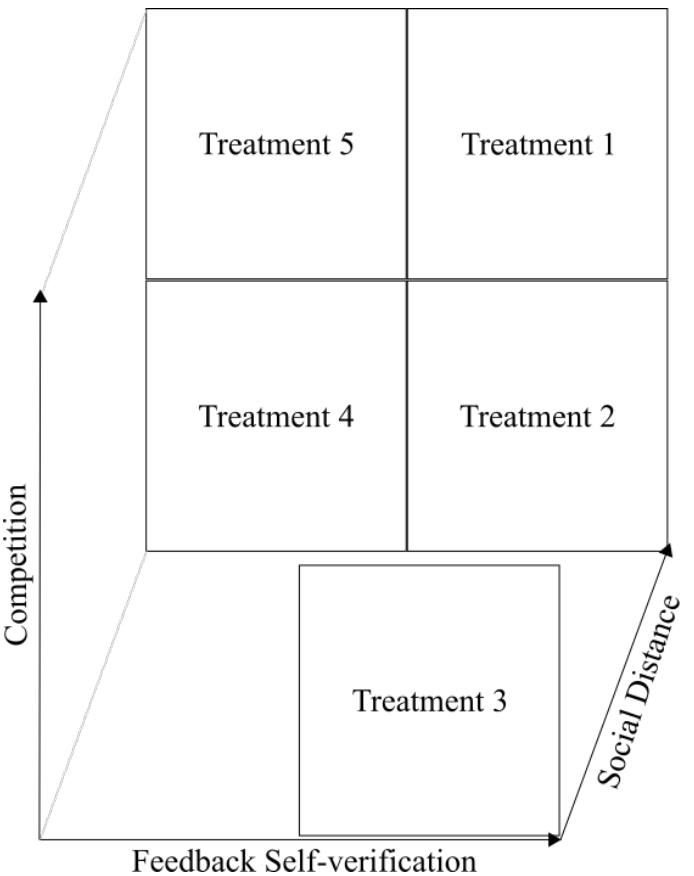


Figure 1: Treatment design

participate in this experiment.

The manipulation of competition is executed with two reward systems that constitute two competition levels. At the low level of competition, all the subjects who submit correct answers receive a fixed and identical reward. At the high level of competition, the size of the reward is determined by the time that subjects take to answer the question correctly. The high competition treatment adds reward brackets so that the subjects who answer correctly and faster receive a greater reward. The low competition treatment resembles the public goods game in which all the subjects in that group are provided the opportunity to claim the reward if they trust the information

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shared by the informed subject.

The experiment is programmed using Z-tree software (Fischbacher, 2007). We let subjects play a quiz game with several questions. There are 16 subjects randomly assigned into four groups of four in every experimental test period. Subjects play two trial periods and ten official periods. There are two questions in each period, and we examine later if bonding within a period occurs. For each period, the subjects are randomly assigned to a group with a new set of three other players to minimize bonding among subjects between periods. The subjects are assigned to two types. The first type is the information holder who has the answer to every question before every quiz begins, and the second type is the uninformed subject who has no information of the answer. Every group has one information holder and three uninformed subjects. The subjects know there is one information holder per group.

There are two stages in the information-sharing experiment. In Stage 1, information holders receive the answer to the upcoming question and need to decide whether to share true information, false information, or not to share. There is a cost to the information holders if they decide to share information. Stage 2 is the quiz stage. All subjects are directed to answer the questions, and they are rewarded based on the reward rules.

The subjects are recruited using the online recruiting system for economic experiments (ORSEE; Greiner (2015)). We use the ORSEE recruiting system, which is commonly used in experimental economics settings. The sample population consists of students at a local university who have registered in ORSEE. Before an experimental session, students registered in our ORSEE are randomly mailed and invited to join the experiment. To meet the criterion of strong social ties for treatment 3 sessions, we invite students from the Indonesian Students' Association, the school baseball team, the cheerleader squad, and the Business Administration Students' Association. They join the experiment as a group. Students are used because of their tendency to be actively involved in online VCs, and analyzing their behaviors provides insights into current and future trends of online information sharing (Limayem, Hirt, and Cheung, 2007).

The Experimental Currency Unit (ECU) is used to calculate the subjects' rewards. All subjects receive a 4,500 ECU initial endowment, and they can earn more, in addition to a show-up fee of NT$50, based on their decisions in the experiment. The reward for each correct answer is 500 ECU in the low competition treatment. The rewards are 1,000 ECU for

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the fastest correct answer, 600 ECU for the second-fastest answer, 400 ECU for the third place, and zero for the fourth place in the high competition treatments. To share information, information holders pay 100 ECU and there is no penalty for not sharing. The conversion rate of all sessions is 50 ECU = NT$1 and, after each session, the rewards are confidentially issued.

The pilot test employs the manipulation of treatment 2 — presence of feedback mechanism, low competition, and high social distance. The trivia quiz has 20 general knowledge questions. The result of the pilot test seems normal, but two technical issues need to be addressed. First, there is confusion about the procedure for sharing information in an open statement style. This problem is handled by using multiple-choice questions instead of open-ended questions in the experiment. The second problem concerns the validity of the feedback mechanism because the answers given by the uninformed subjects can come from other sources. For example, the subjects might know the answers from their own previous knowledge before receiving the information from the information holders, and some subjects attempt to use their mobile phones to search for the answers on the Internet, although we strictly prohibit using mobile phones. To enhance the functionality of the feedback mechanism and prevent this problem from happening during the experiment, the questions used for the quiz are changed from general knowledge to neutral questions. For instance, “Imagine there are 5 red boxes numbered from 1 to 5, which one has an egg inside?" This type of question removes the possibility of correct answers coming from uninformed subjects' personal sources. For details about the experiment, the original instructions in Chinese and an English translation are provided in Appendix A. The list of questions used in the pilot test and the experiment is included in Appendix B. The appendix will be available in the online publication.

4 Results

The experiments are conducted in January 2016, and in June and October 2017. We summarize the basic statistics of sharing in Table 2. Four sessions are conducted for each treatment, except for treatment 5, for which we have one additional session. We examine 1,680 decisions made by 84 focal (informed) subjects in the role of information holder across five treatments. Every session has 10 periods, resulting in a total of 20 question rounds. The information holders share true information in about 53 percent of the rounds, share false information in about 5 percent of the rounds, and do

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Table 2: Information holders' sharing decisions

Information	T3 FLL	T2 FLH	T1 FHH	T4 NLH	T5 NHH	Total
Sharing False	15	15	21	10	24	85
	4.69%	4.69%	6.56%	3.13%	6%	5.06%
No Sharing	56	126	131	156	232	701
	17.50%	39.38%	40.94%	48.75%	58%	41.73%
Sharing True	249	179	168	154	144	894
	77.81%	55.94%	52.50%	48.13%	36%	53.21%
Average payoff	$ 288	$ 311	$ 423	$ 317	$ 499	$ 374
Total	320	320	320	320	400	1,680

Note: "T" stands for treatment. We use acronyms to remind readers the manipulations in every treatment. The first letter is either "F" or "N" (Feedback or No feedback), the second letter is "L" or "H" for competition (Low or High), and the third letter is "L" or "H" for social distance (Low or High). For example, Treatment 2 is FLH: with feedback, low competition, and high social distance. Columns ordered by sharing true decisions. The percentages correspond to column totals. The average payoff does not include the show-up fee. The average payoff in "Total" column is a weighted average by number of subjects per treatment.

not share information in about 42 percent of the rounds. Our main analysis focuses on sharing (true) versus not sharing since sharing false information rarely occurs — potentially due to its cost, and it is concentrated in a few outlying subjects.

Treatment 3 provides the friendliest environment (low competition, low social distance, with feedback) for sharing, yielding the highest percentage of information sharing, 78 percent and the lowest average payoff NT$288. Sharing percentages decline and the average payoff increases as more disincentives to sharing are introduced into the experiment. Treatment 2 portrays 56 percent of information sharing and an average payoff of NT$311. Treatment 1 shows 53 percent of information sharing and an average payoff of NT$423. Treatment 4 exhibits 48 percent of information sharing and an average payoff of NT$317. Finally, Treatment 5 is the least friendly sharing environment with 36 of percent information sharing and the highest average payoff of NT$499. Graphically, we observe in Figure 2 that the effects

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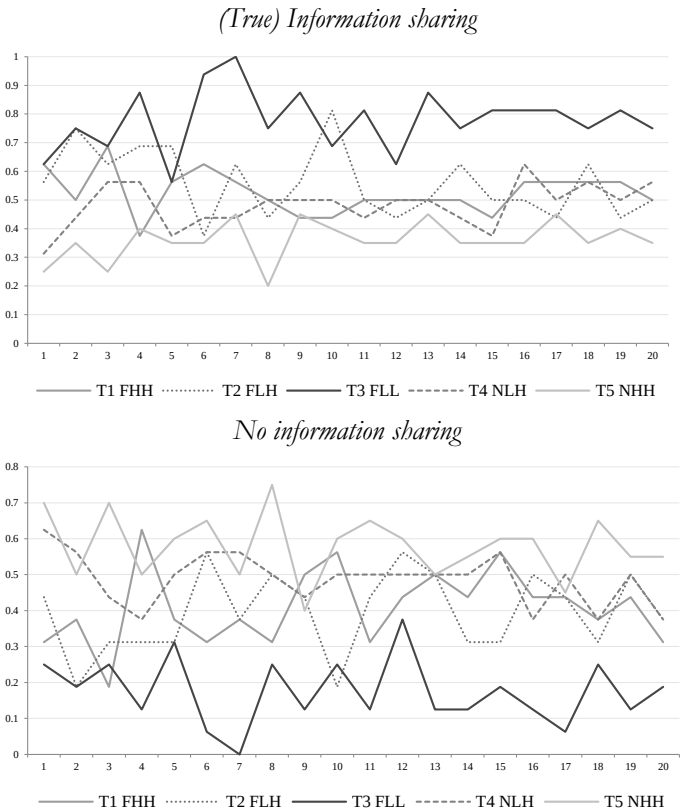


Figure 2: Information sharing percentage over question round by treatment

of the variable manipulations persist throughout the question rounds of the experiment. Treatment 3 is clearly above other treatments in sharing information and below in not sharing information. On the contrary, treatment 5 presents conditions that promote the least frequency of information sharing and the highest frequency of not sharing. To contrast the hypotheses of the study, we perform further statistical analysis as follows.

We start the analysis of information sharing for the two questions asked in the same period. We analyze whether information holders act differently for the second question due to other concerns such as bonding. We run a

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Wilcoxon signed-rank test for paired samples comparisons and find no significant difference between the sharing decisions of question 1 and question 2 across periods. We then pool the data as 20 question rounds to proceed with our analysis.[2]

To see the effects of the treatment manipulation on information sharing, we run the Mann-Whitney U (MWU) test contrasting the average number of information sharing decisions in different treatments. Table 3 shows the results of the test and Figure 3 portrays the average frequencies of information sharing for visual comparison. We observe the following results. First, after pooling treatments at the same level of feedback, there is a significant difference in information sharing favoring sharing in presence of a feedback mechanism. Then, after pooling treatments at the same level of competition, we find no significant differences in information sharing. Finally, the comparison between T2 and T3 indicates a significant difference in information sharing suggesting that low social distance between subjects encourages information sharing. To prevent confounding results, we do not compare the pooled data for high social distance against T3 because treatments are off balance with only T3 for the low level of social distance.

We further analyze the sharing behaviors with more formal statistical tools. We run three logistic regression models where the decision of information sharing is the dependent variable, and its predictors are the main effects of feedback, competition, and social distance coded as dummy variables. The results shown in Table 4 correspond to these models. First, a model clustered by subject with robust standard errors. Then, a panel model with random effects (Model 1). Finally, unlike the previous two models with the presence of feedback as predictor, a panel model that accounts for the number of positive or negative feedback received in the previous question round (Model 2).[3] In Table 3, we observed a significant difference between treatment 4 and 5 that can potentially suggest an interaction between competition and other variables. However, we run additional models testing interactions between the predictors and no significant interactions are detected. We also test for a potential time effect using “S10" as a dummy variable that represents the second 10 question rounds starting from

[2]We also run regression models based on samples with only question 1 or question 2 in every period, we do not find any significant difference either.

[3]The maximum number of positive and negative feedback that an information holder can receive in any question round is 3. Remember there are 4 subjects in every group.

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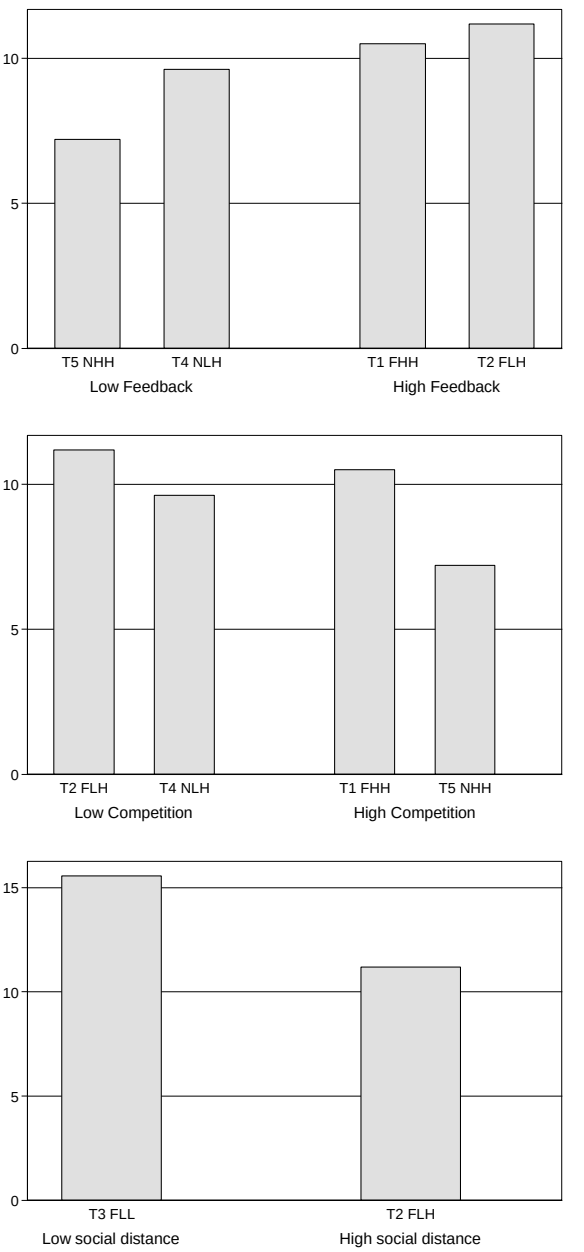


Figure 3: Average frequencies of information sharing by treatment

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Table 3: Effect of treatment manipulation on information sharing

Feedback		n	MWU
Low	T5 NHH	16	1.585*
High	T1 FHH	20	
Low	T4 NLH	16	0.832
High	T2 FLH	16	
Low	T4 + T5	32	1.689**
High	T1 + T2	36	
Competition			
Low	T2 FLH	16	−0.512
High	T1 FHH	16	
Low	T4 NLH	16	−1.344*
High	T5 NHH	20	
Low	T2 + T4	32	−1.245
High	T1 + T5	36	
Social Distance			
Low	T3 FLL	16	−1.943**
High	T2 FLH	16	

Note: ** p < 5%, * p-value < 10%. “n" stands for number of subjects. “MWU" stands for Mann-Whitney one-tailed U test. Treatment acronyms consistent with Table 2.

period 6.

The clustered logistic model and Model 1 portray two significant effects on information sharing: a positive effect of feedback mechanism and a negative effect of social distance. The alignment of the significant effects of the logistic models and the MWU test provide evidence to support hypotheses 1 and 3. Notably, Model 2 discerns that the main driver of information sharing within the feedback mechanism is the positive feedback from the previous question. Regarding the effect of competition, the experiment does not provide evidence to validate hypothesis 2.

To address the concern of a limited number of subjects and provide

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Table 4: Logistic regression on true information sharing by subject

	Clustered	Random-effects Panel Logit	
Information Sharing	Robust SE	Model 1	Model 2
Feedback	0.6483*	1.1648*	
	[1.9123]	[3.2053]	
Positive feedback$_{t-1}$			0.4958***
			[1.6418]
Negative feedback$_{t-1}$			0.2558
			[1.2914]
Competition	−0.345	−0.7407	−0.7674
	[0.7082]	[0.4768]	[0.4642]
Social Distance	−1.0498**	−1.5608*	−1.3299*
	[0.35]	[0.21]	[0.2645]
Feedback × S10	−0.1936	−0.2896	
	[0.824]	[0.7486]	
Competition × S10	0.1027	0.2647	0.3121
	[1.1082]	[1.303]	[1.3662]
Social Distance × S10	0.0038	−0.0035	−0.1519
	[1.0038]	[0.9965]	[0.8591]
Constant	0.9432**	1.4041	1.4255**
	[2.5682]	[4.0719]	[4.16]
Wald X^2	22.48***	17.07***	56.37***
Hosmer-Lemshow X^2	4.37		
Rho		0.6332***	0.5865***
Hit Ratio	61.70%	61.69%	66.71%
N (subjects)	1,595(84)	1,595(84)	1,516(84)

Note: *** p < 1%, ** p < 5%, * p < 10%. Odd ratios in brackets. “SE" stands for standard error. “S10" stands for second 10 questions. Model 2 interactions of positive and negative response with S10 are not significant and are not reported. “N" stands for number of decisions.

robustness to our results, we recalculate Model 1 using non-parametrical bootstrapping resample with replacement 599 times, as suggested by Wilcox (2010, p. 155). This random process may draw original observations once, more than once, or not at all, to compute the standard errors of the coefficients of Model 1 (Cameron and Trivedi, 2010). We obtain that the boot-

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strap standard errors of Model 1 lead to significant coefficients for feedback and social distance at 10 percent, which contribute to the reliability of our results (Thompson, 1993) and support the replicability of our experiment (Zientek and Thompson, 2007).

The results from Model 1 indicate that informed subjects interacting with a feedback mechanism have 3.21 times the odds of sharing information compared to those interacting without a feedback mechanism (OR = 3.2053), whereas informed subjects in environments with high social distance have 21 percent the odds of sharing information compared to those in environments with low social distance (OR = 0.21). In addition, we do not find significant interaction effects between question round and the three main variables in any of the models.[4] We also run the models using group dummies and do not find significant group effects.

To further understand how feedback affects information sharing, we examine the information holders' propensity after the positive and negative feedback responses from uninformed subjects. The aggregate data shows that information holders share information 66 percent of the times after negative feedback while they share information 84 percent of the times after positive feedback. Model 2 in Table 4 provides a clear insight of what happens analyzing individual data.[5] We find that positive feedback from the previous question round has a significant positive effect on information sharing while negative feedback has no significant effect. This result implies that subjects may only be considering the feedback responses supporting their own "good person" self-image and disregarding the negative feedback. Corresponding well to the self-verification theory, positive feedback allows subjects to confirm their self-image reinforcing the continuation of the "good" behavior.

5 Discussion

The main driver of our study is to understand the effect of self-verification on information sharing decisions. To identify this effect, the first consideration is to minimize the influence of extrinsic incentives. Prior literature

[4] Besides testing the first 10 question rounds against the 10 last ones, we also run for time effects for all rounds and do not find any significance for a particular round.

[5] We would like to thank the anonymous reviewer whose recommendations led to the inclusion and interpretation of Model 2.

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has shown that reciprocity, reputation, and others' identification influence humans' prosocial behaviors (Andreoni and Petrie, 2004; Fehr, Fischbacher, and Gächter, 2002; Reinstein and Riener, 2012) and how anonymity can reduce their influence (Eckel and Grossman, 1996; Locey and Rachlin, 2015). Thereby, subject anonymity is a required feature of our experimental design in search of self-verification. The second consideration is the prevalent intrinsic incentives derived from altruism. Sharing between anonymous subjects are is a behavior driven by pure and impure altruism (Andreoni, 1989, 1990). Theoretically, altruism should not be influenced by others' opinions, especially in an anonymous environment. Consequently, we manipulate the presence of a feedback mechanism where unidentifiable subjects approve or disapprove actions of an unidentifiable information holder. In treatments without feedback, the frequencies of information sharing are mainly attributable to altruism. While, in treatments with feedback, salient changes in sharing patterns are interesting and our study posits that this change results from a process of self-verification.

The data from the experiment supports the hypothesis that feedback self-verification promotes information sharing. This result compares well to previous studies analyzing intrinsic incentives for information derived from reinforcing self-image. Bénabou and Tirole (2011) conclude that individuals signal themselves using their actions and gain utility if the actions comply with their self-image. For individuals seeking self-verification as experts, Kankanhalli, Tan, and Wei (2005) discuss the importance of self-efficacy — the confidence in one's knowledgeability — determining information sharing behaviors. Another potential explanation is that feedback allows the establishment of a social norm. Kimmerle et al. (2011) find that individuals anchor to the behavioral guidelines of information sharing provided by social pressure and the expected standard of a good deed. Since social pressure in anonymity is unlikely to determine a behavioral guideline, we assess the explanation of the expected standard of a good deed. When there is no feedback mechanism, the standard for whether subjects should share is not clearly defined, and then deciding not to share is not perceived as detrimental to their self-image. However, the feedback mechanism provides subjects a social norm to anchor and forms an upward standard that stimulates sharing.

Our results detect that the effect of feedback is mainly exerted by positive feedback from previous interactions and that negative feedback is predominantly disregarded. This finding coincides with the self-verification the-

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ory, which predicts that information holders confirm their “good" self-image with sources reflecting their goodness. However, we acknowledge that negative feedback can play a more significant role in information sharing when an information holder decides to stop sharing false information after receiving negative feedback. This is not captured in our experiment since sharing false information is costly and infrequent. Thereby, we encourage future researchers to explore other scenarios where feedback self-verification confirms someone as a “bad" person and triggers personal improvement.

The negative effect of social distance on information sharing in our experiment aligns to previous findings in the economics literature. Hoffman, McCabe, and Smith (1996) detect that decreasing social distance and increasing the possibility of a reciprocal relationship generate higher offers in dictator games. Similar results are detected by Charness and Gneezy (2008) and Bohnet and Frey (1999) after reducing social distance by revealing the family name of the subjects and asking them to stand up in silence to look at each other, respectively. Unlike these experiments where social distance is induced, our experimental manipulation utilizes the pre-existing interactive relationships between subjects and finds that closer relationships stimulated information sharing.

Our experiment does not provide evidence to sustain the negative effect of competition on information sharing. This result differs from previous literature. We contemplate the possibility that the competition manipulation does not represent a salient loss for the information holder. Compared to Ardichvili et al. (2006), the cost of information sharing in their studied scenario includes lower performance at the workplace and potentially losing their jobs, which is a considerably larger cost than in our experiment. Another akin consideration is that the information holder does not input effort to obtain information in our experiment. Sun, Fang, and Lim (2012) required subjects to complete IT-relevant tasks before measuring their intention to share information. Completing these tasks reminds subjects of their personal effort to acquire that information, which adds up to the cost of information sharing and later hinders their intention to share in virtual communities. We encourage future studies to continue exploring the role of competition and under which conditions it might be unfavorable to information sharing.

Our study advances knowledge on information sharing behaviors in VCs, which is notably important for firm performance through improved innovation, intellectual capital, and co-creation of products (Nahapiet and

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Ghoshal, 1998; Wang, Sharma, and Cao, 2016; Yang and Li, 2016). The finding of a significant positive effect from feedback self-verification sheds light on ways that firms can design their VC characteristics and policies. An updated and precise feedback tied to an alias is expected to encourage people to share true information even when the alias is not traceable to a specific employee. We urge managers to include a feedback mechanism in their internal VCs and do not underestimate information sharers who prefer contributing anonymously. Furthermore, activities to build stronger social ties between employees should be of paramount importance for executives given that lower social distance demonstrates to be a determinant of information sharing.

6 Conclusion

Superhero films often give their superheroes secret identities to provide cover when they help others at their own expense. This is fiction, but actual examples of giving and sharing without expecting retribution can be found in online VCs. For instance, forum participants are only identified with an alias when they contribute to discussions and answer questions on those crowdsourcing platforms. From 2021, participants of Facebook groups are allowed to post anonymously in the group discussions and subsequent comments providing helpful information to the group members. Our study is motivated by these phenomena, and we find that feedback promotes information sharing even in harsh environments with intense competition and deep social distance. We posit that the existence of a feedback mechanism allows subjects to self-verify themselves as “good" people, elevating their perception of what is right and noble as a human being, and sharing information to act accordingly with their desired self-image. Therefore, we often find many people who help others even when they are not publicly recognized. People have an inner superhero willing to share information and feel self-worth about their abilities to do remarkable things while confirming their self-image. The implications derived from our findings encourage firms to shape their VC policies so that their employees will be more willing to contribute their knowledge.

Our contribution to knowledge is threefold. First, we find that feedback has a significant positive effect on information sharing despite anonymity. Second, we propose that this phenomenon can be explained by self-verification theory. Third, we confirm the role of social distance in information sharing

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using data from a controlled behavioral experiment.

One of the limitations of our study is the use of money for the cost of sharing information. In VCs, the cost of sharing information is likely to be intangible and in terms of the time and effort to make information available. These costs are subjective and hold different values for different people. Future studies can manipulate the type and amount of the cost of sharing information to generate new insights into the topic. Finally, further research is required to assess self-verification in relation to other common actions and features within VCs and other enterprise settings.

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內在英雄: 匿名虛擬社群中資訊分享的實驗

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在匿名的情境中, 傳統上對於資訊分享所期望的社會效益相對較低, 因爲缺乏公開的認可。然而, 在匿名的別名下, 許多虛擬社群卻出現了積極的資訊交流。本研究探討了在匿名環境下, 回饋機制以及兩個因素 — 競爭和社會距離 — 對資訊分享的作用。我們的實驗研究, 在控制互惠和匿名性的基礎上, 顯示出回饋機制和減少社會距離有助於促進資訊分享, 特別是積極的回饋。在這些情況下, 回饋機制的有效性可以通過自我驗證理論來解釋, 其中分享成爲自我形象的積極強化。我們對於資訊分享的研究發現對於欲提升創新和協作的企業提供了有用的管理意涵。

關鍵詞: 反饋, 資訊分享, 自我驗證, 社會關係距離, 虛擬社區
JEL 分類代號: A13, C71, D83

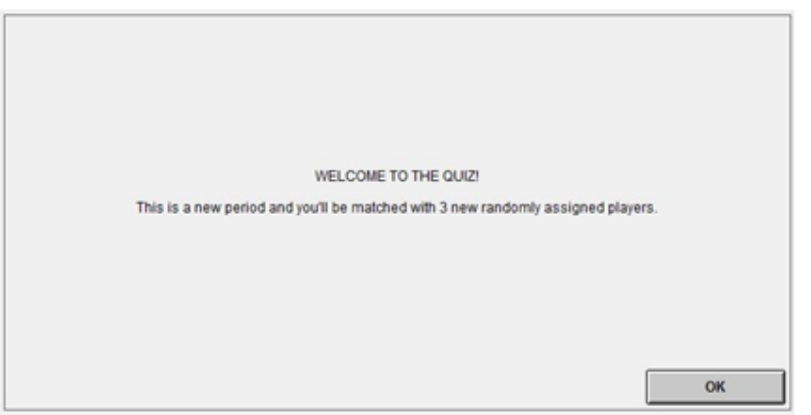
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Appendix 1: Experiment instructions for treatment 1 (High social capital, high competition and high social distance)

Chinese original version

實驗教學

歡迎來參加實驗。這實驗將會請您回答一些隨機問題。參與者會被隨機分配爲「信息持有者」及「不知情參與者」, 而且您將會一直扮演一開始被分配到的角色。在等候其他參與者的準備期間, 您會看到預設畫面。當所有參與者都準備好後, 在您的視窗中, 您就會看到如下圖之介紹頁面 (包含招呼語以及進入下一階段之提醒訊息)。此介紹頁面會在您每次進入下一回合時重複出現。每一回合, 系統會以隨機的方式將四個參與者分成一組。您將與其他三位參與者進行互動。

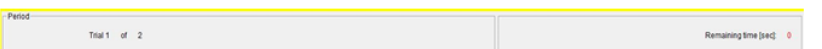


每個參與者將獲得新台幣 50 元的出席費, 另外又可獲得獎金。獎金的多寡將由參與者與其他參與者的選擇而定。參與者在實驗一開始會獲得 4,500 個 ECU (實驗代幣) 作爲實驗基金。獎金將依是否答對與遞交答案的速度而有所不同。每一題題目, 若您沒答對, 您將不會得到任何獎金。在答對的參與者中, 最快遞交答案的參與者將獲得獎金 1,000ECU, 第二位遞交答案的參與者將獲得 600ECU, 第三位遞交的參與者將得到 400ECU, 第四位將不會有獎金。在這個實驗中, 將有 10 個回合共 20 個測驗題, 參與者最多可得到 24,500ECU (4,500ECU 的實驗基金與 20,000ECU 的獎金), 外加新台幣 50 元出席費。實驗代幣的兌換匯率爲 1NT$ = 50ECU。在實驗的最後, 我們會將您獲得的實驗代幣總額換算成新台幣支付給您。

在進入正式測驗前, 會有兩個練習回合 (目前我們正在進行第一個練習回合, 藉以示範說明本實驗), 每個練習回合只有一個測驗題, 幫助您熟

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悉整個實驗方式。練習回合結束後, 就開始正式測驗。正式的實驗包含十個回合, 每個回合有兩個測驗題。目前階段之訊息欄如下圖所示。請注意, 除了在問題回答階段有時間限制外, 其他的決策階段都沒有時間限制, 所以右方的所剩時間欄位將顯示爲零。在問題回答的階段, 您將有30秒的時間回答該題目。



STAGE 1

如果您在此測驗中的角色為「不知情參與者」, 這表示: 除非「信息持有者」決定跟您分享答案, 否則您將不會從其他參與者獲得測驗問題的答案。在介紹頁面後, 題目的答案提示會出現在「信息持有者」的螢幕上, 在他們做出分享決定前, 您將會看到如下圖的等候視窗。

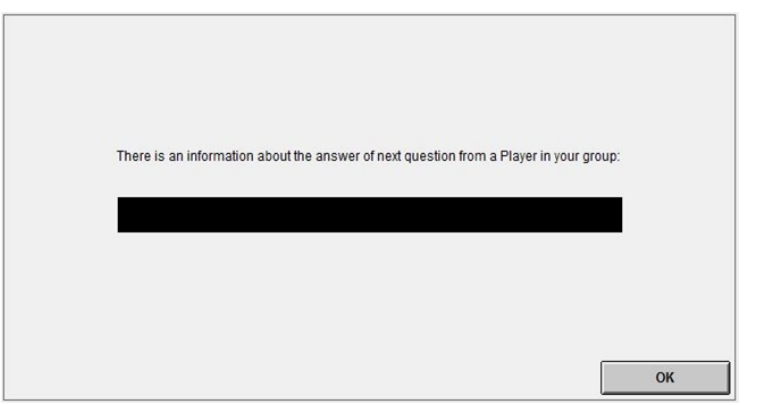
如果您在此測驗中的角色為「信息持有者」, 這表示: 您可以得知所有測驗問題的答案。在介紹頁面後, 題目的答案提示將會出現在您的螢幕上, 而其他「不知情參與者」必須等候您是否願意分享答案資訊的決定。如下圖所示, 您可以有三種選擇: 分享正確答案資訊給同組的其他參與者、或故意分享錯誤答案資訊, 抑或不願分享答案資訊。如您選擇分享答案資訊 (無論正確與否), 系統將從您的累計所得 (包含一開始給您的實驗基金加上您在回答題目的該回合之前所累積之獎金) 裡扣除 100ECU 作爲分享資訊的代價。當其他三位參與者收到您分享的答案資訊後, 您也會收到他們對您所分享之答案資訊的評價。在目前的畫面所顯示的評價爲截至目前回合前的評價總計。評價會於正式的回合開始後開始累積。(如下方第二個圖示)。現在, 請您按下中間三個按鍵中最左邊的 “Share Info" 鍵。請注意, 選擇是否分享資訊是您的自由。目前的選擇只是爲了示範實驗的操作。當您完成以上程序時, 您將會看到一個等候畫面。請您耐心等待下一個階段。

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STAGE 2

如果您在此測驗中的角色為「不知情參與者」。當「信息持有者」決定分享他們的答案資訊, 您將會收到如下圖所示之答案提示。您可以將此提示信息寫下來以免忘記, 但這非強制性要求。當您準備好後, 請按下 OK 鍵, 您將會進入等候畫面, 等候進入問答階段。當「信息持有者」決定不分享他們的答案資訊, 您將不會看到目前的畫面而會直接進入等候畫面, 等待問答階段。現在請您按下 OK 鍵。

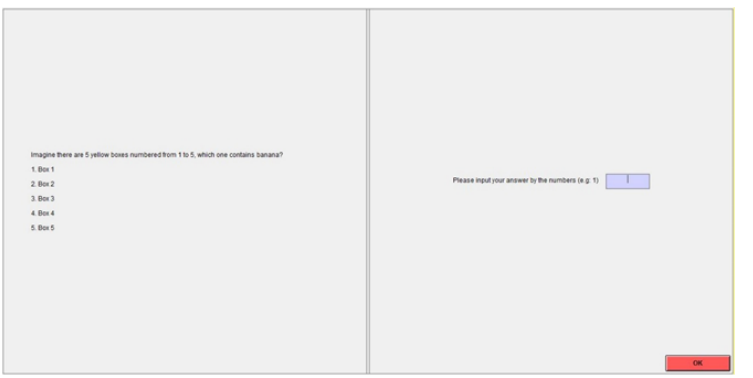


STAGE 3

現在所有參與者已進入問答階段, 所有參與者的畫面被分爲左右兩個部分。(如下圖所示)。左側頁面爲題目及選項。右側頁面爲回答方塊。現在, 請將您所選擇的選項代碼輸入在回答方塊內, 然後按下 OK 鍵, 進入下一

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階段。請注意, 您將有 30 秒的時間回答問題, 如果您沒有在限制時間內完成作答, 對於該題目, 您將不會得到任何獎金。



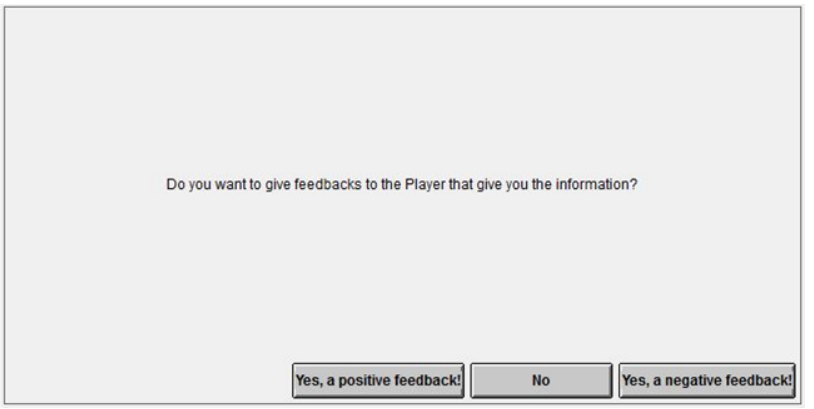
在所有參與者都完成作答後, 您將會看到正確答案, 及在此回合中您所獲得的實驗代幣。請注意! 在練習回合的測試題將不計分。看完後, 請按下 OK 鍵, 進入下一階段。



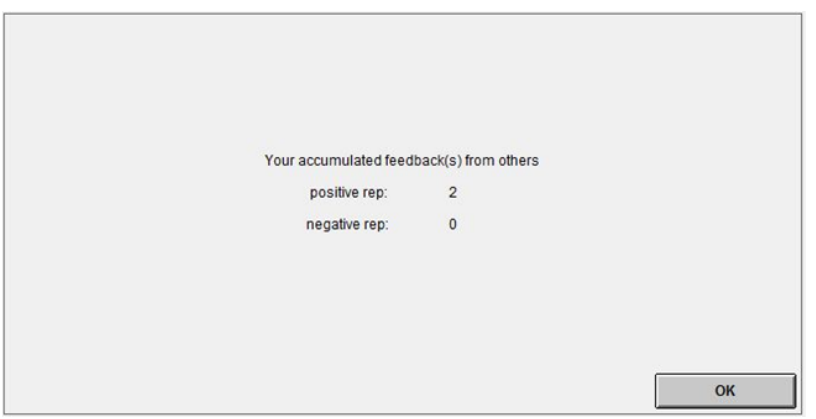
STAGE 4

如果您在此測驗中的角色為「不知情參與者」。針對目前的題目, 若您有收到「信息持有者」所分享的答案提示, 要求提供評價之頁面將會出現在您的螢幕中 (如下圖所示)。您可以依據您對答案提示的感想做下列三種選擇: 給予正面評價、負面評價或不給評價。如果在上階段您沒有收到答案提示或您已給予評價, 等候頁面會出現於螢幕上。當其他參與者的評價動作也完成後, 系統才會進入下一階段。

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如果您在此測驗中的角色為「信息持有者」。如果您在此題目有分享答案資訊給予您的同組參與者, 您將等候其他參與者給予您評價, 若您沒有分享答案資訊, 請耐心等待其他組參與者完成他們的選擇。當所有參與者完成評價, 畫面將顯現您的評價總結 (如下圖所示)。您只會獲得您同組參與者的評價。當您看完您的組員給您的評價分數後, 請按 OK 鍵, 進入新的階段或回合。



在全部十個回合中, 同樣的步驟將反覆進行, 每個回合有兩個測驗題。每個回合系統將隨機、從新分配三個組員與您同組。在完成全部十回合後, 請稍候片刻, 基本資料調查頁面即將出現。在您完成填寫後, 請繼續留在座位上, 叫到您的名字時, 請上前領取酬金。

謝謝您的參與! 對實驗程序如仍有任何不清楚的部分, 您都可以直接詢問實驗現場的研究人員。另外, 請您勿對外透露任何有關於本實驗內容的相關訊息, 因爲那有可能會影響研究結果的真實性。

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English translation

The experimental sessions are only conducted in Chinese, the translation is provided for the readers of the published article.

Experimental instructions

Welcome to the experiment. This experiment will ask you to answer some random questions. Participants will be randomly assigned as “Information Holders" and “Uninformed Participants," and you will continue to play the role you were initially assigned. While waiting for other participants to get ready, you will see a default screen. Once all participants are ready, you will see the introduction page in your window, which includes a greeting and a reminder message for moving to the next stage. This introduction page will appear every time you enter a new period. In each period, the system will randomly group four participants. You will interact with the other three participants in your group.

Each participant will receive a show-up fee of NT$50 and may also receive a bonus. The amount of the bonus will depend on the choices made by participants and other participants. At the beginning of the experiment, participants will receive 4,500 Experimental Currency Units (ECUs) as experimental funds. The bonus amount will vary depending on whether you answer correctly and the speed of submitting your answers. For each question, if you do not answer correctly, you will not receive any bonus. Among the participants who answer correctly, the one who submits the answer first will receive a bonus of 1,000 ECU, the second participant to submit an answer will receive 600 ECU, the third participant will receive 400 ECU, and the fourth participant will not receive a bonus. In this experiment, there will be ten periods with a total of 20 test questions. Participants can earn up to 24,500 ECU (4,500 ECU of experimental funds and 20,000 ECU of bonus), plus a show-up fee of NT$50. The exchange rate for the experimental currency is 1 NT$ = 50 ECU. At the end of the experiment, the total amount of experimental currency you have earned will be converted and paid to you in NT$.

Before entering the actual test, there will be a practice period with two questions (currently, we are conducting the first question of the practice period to demonstrate the experiment). The practice period will help you become familiar with the experiment procedure. After the practice period,

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the formal test will begin. The formal experiment consists of ten periods, each with two test questions. The current information column is shown in the image below. Please note that, except for the time limit during the question answering stage, other decision stages do not have time limits, so the remaining time column on the right will display as zero. During the question answering stage, you will have 30 seconds to answer the question.

STAGE 1

If your role in this experiment is “Uninformed Participant," it means: You will not receive answers to the test questions from other participants unless “Information Holders" decide to share the answers with you. After the introduction page, the answer hint will appear on the screens of “Information Holders." You will see a waiting window, as shown in the image below, until they make the sharing decision.

If your role in this experiment is “Information Holder," it means: You will have access to the answers to all test questions. After the introduction page, the answer hint will appear on your screen, while other “Uninformed Participants" must wait for your decision to share the answer information. As shown in the image below, you have three choices: Share the correct answer information with fellow participants in your group, intentionally share incorrect answer information, or choose not to share answer information. If you choose to share answer information (regardless of correctness), the system will deduct 100 ECU from your accumulated earnings (including the initial experimental fund given to you and any accumulated bonus before answering the question in that period) as the cost of sharing information. After the other three participants receive the answer information you shared, you will also receive their evaluations of the answer information you provided. The evaluations displayed in the current screen are the cumulative evaluations up to the current period. Evaluations will accumulate after the formal periods begin (as shown in the second image below). Now, please press the “Share Info" button on the leftmost side among the middle three buttons. Please note that whether to share information is your choice. The current choices are just for demonstrating the experiment operation. Once you complete this process, you will see a waiting screen. Please wait patiently for the next stage.

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STAGE 2

If you are an “Uninformed Participant" in this experiment, when “Information Holders" decide to share their answer information, you will receive an answer hint as shown in the image below. You can write down this hint if you wish, but it is not mandatory. When you are ready, press the OK button to enter the waiting screen and wait for the question-answer stage. If “Information Holders" decide not to share their answer information, you will not see the current screen and will directly enter the waiting screen, waiting for the question-answer stage. Now, please press the OK button.

STAGE 3

Now all participants have entered the question-answer stage, and the screens of all participants are divided into two parts (as shown in the image below). The left side shows the question and options, while the right side is the answer box. Now, enter the option code you have selected in the answer box, and then press the OK button to proceed to the next stage. Please note that you will have 30 seconds to answer the question. If you do not complete the answer within the time limit, you will not receive any bonus for that question.

After all participants have answered, you will see the correct answer and the amount of experimental currency you earned in this period. Please note that the test questions in the practice period will not be scored. After reviewing this information, press the OK button to proceed to the next stage.

STAGE 4

If you are an “Uninformed Participant" in this experiment, for the current question, if you have received an answer hint from an “Information Holder," the page asking for your evaluation will appear on your screen (as shown in the image below). You have three options based on your feelings about the answer hint: give a positive evaluation, a negative evaluation, or no evaluation. If you did not receive an answer hint in the previous stage or if you have already given an evaluation, the waiting page will appear on the screen. Once evaluations from other participants are complete, the system will move to the next stage.

If you are an “Information Holder" in this experiment:

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If you have shared answer information with your fellow group participants for this question, you will wait for other participants to provide you with evaluations. If you have not shared answer information, please patiently wait for other group participants to complete their choices. When all participants have provided evaluations, the screen will display a summary of the evaluations you received (as shown in the image below). You will only receive evaluations from participants in your group. After reviewing the scores given by your group members, press the OK button to proceed to a new stage or period.

Throughout all ten periods, the same steps will be repeated, with two test questions in each period. In each period, the system will randomly assign three new group members to your group. After completing all ten periods, please wait for a moment; the basic information survey page will appear soon. After you have completed the survey, please remain seated. When your name is called, come forward to receive your compensation.

Thank you for participating! If you have any unclear parts about the experiment procedure, you can directly ask the on-site researchers. Additionally, please do not disclose any information related to the content of this experiment to outsiders, as it could affect the authenticity of the research results.

Differences with other treatment instructions

- Compared to Treatment 1, Treatment 2 and 3 have low competition; therefore, participants are informed that they will receive a payoff if the answer is correct disregarding how fast they replied. These two treatments have the same instructions because the low social distance manipulation in Treatment 3 is reflected in the selection of participants who know each other.
- Compared to Treatment 1, Treatment 4 has low competition and no feedback. Participants are informed about their positive payoff if the answer is right. However, after information holders share information, there is no feedback instrument for uninformed participants to evaluate their satisfaction (No Stage 4).
- Compared to Treatment 1, Treatment 5 has no feedback. There is no available feedback instrument for uninformed participants to evaluate their satisfaction with the information shared (No Stage 4).

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Appendix 2: Questions of the information sharing game

Trial period

1. Imagine there are 5 yellow boxes numbered from 1 to 5, which one contains banana? (Box 4)
   Options: Box 1, Box 2, Box 3, Box 4, Box 5.
2. Imagine there are 5 spheres numbered from 1 to 5 with water inside, which one contains sugar? (Sphere 5)
   Options: Sphere 1, Sphere 2, Sphere 3, Sphere 4, Sphere 5.

Lists of questions for question 1

3. Imagine there are 5 red boxes numbered from 1 to 5, which one has an egg inside? (Box 3)
   Options: Box 1, Box 2, Box 3, Box 4, Box 5.
4. Imagine there are 5 cups with lid numbered from 1 to 5, which one has coffee inside? (Cup 1)
   Options: Cup 1, Cup 2, Cup 3, Cup 4, Cup 5.
5. Imagine there are 5 trees in front of you numbered from 1 to 5, which one has a hidden bird's nest? (27 years)
   Options: Tree 1, Tree 2, Tree 3, Tree 4, Tree 5.
6. Imagine there are 5 buildings in front of you numbered from 1 to 5, which one is haunted? (Building 5)
   Options: Building 1, Building 2, Building 3, Building 4, Building 5.
7. Imagine there are 5 caves in front of you numbered from 1 to 5, which one has diamond inside? (Cave 1)
   Options : Cave 1, Cave 2, Cave 3, Cave 4, Cave 5.
8. Imagine there are 5 maps in front of you numbered from 1 to 5, which one directs you to the treasure? (Map 2)
   Options: Map 1, Map 2, Map 3, Map 4, Map 5.
9. Imagine there are 5 black backpacks in front of you numbered from 1 to 5, which one has the bomb inside? (Backpack 5)
   Options: Backpack 1, Backpack 2, Backpack 3, Backpack 4, Backpack 5.
10. Imagine there are 5 cars in front of you numbered from 1 to 5, which one has no gas inside it? (Car 3)
    Options : Car 1, Car 2, Car 3, Car 4, Car 5.

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11. Imagine there are 5 scooters in front of you numbered from 1 to 5, which one has a flat tire? (Scooter 4)
    Options: Scooter 1, Scooter 2, Scooter 3, Scooter 4, Scooter 5.
12. Imagine there are 5 wallets in front of you numbered from 1 to 5, which one has the most cash? (Wallet 1)
    Options: Wallet 1, Wallet 2, Wallet 3, Wallet 4, Wallet 5.

Lists of questions for question 2

1. Imagine there are 5 computers in a house numbered from 1 to 5, which one is broken? (Computer 1)
   Options: Computer 1, Computer 2, Computer 3, Computer 4, Computer 5.
2. Imagine there are 5 shirts in a drawer numbered from 1 to 5, which one is the most expensive? (Shirt 4)
   Options: Shirt 1, Shirt 2, Shirt 3, Shirt 4, Shirt 5.
3. Imagine there are 5 routes from point A to point B numbered from 1 to 5, which one is the shortest? (Route 3)
   Options : Route 1, Route 2, Route 3, Route 4, Route 5.
4. Imagine there are 5 books in front of you numbered from 1 to 5, which one is blank? (Book 1)
   Options: Book 1, Book 2, Book 3, Book 4, Book 5.
5. Imagine there are 5 pens in front of you numbered from 1 to 5, which one has no ink? (Pen 2)
   Options: Pen 1, Pen 2, Pen 3, Pen 4, Pen 5.
6. Imagine there are 5 pencil cases in front of you numbered from 1 to 5, which one is empty? (Pencil case 4)
   Options: Pencil case 1, Pencil case 2, Pencil case 3, Pencil case 4, Pencil case 5.
7. Imagine there are 5 vases in front of you with flowers numbered from 1 to 5, which one contains fake flowers? (Vase 3)
   Options: Vase 1, Vase 2, Vase 3, Vase 4, Vase 5.
8. Imagine there are 5 streetlights in front of you numbered from 1 to 5, which one shines the brightest? (Streetlight 1)
   Options: Street light 1, Street light 2, Street light 3, Street light 4, Street light 5.

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9. Imagine there are iPods in front of you numbered from 1 to 5, which one has the most songs? (iPod number 5)
   Options: iPod number 1, iPod number 2, iPod number 3, iPod number 4, iPod number 5.
10. Imagine there are 5 doors in front of you numbered from 1 to 5, which one is not locked? (Door 2)
    Options: Door 1, Door 2, Door 3, Door 4, Door 5.

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