미디어와 군중 지혜효과 연관성 연구

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How Media Exposure Distorts the Wisdom of the Crowd Effect

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요 약 본 연구는 군중지혜효과가 사회 현상에 따라 달라질 수 있다는 것에 대한 논의를 했다. 본 연구의 배경에는 2010년도에 발생한 타블로 사건에 대해 사회 현상학적으로 이해를 하고자 하는 측면에서 연구되었다. 군중지혜효과 측면에서 소셜미디어가 주는 영향성을 평가하기 위해 50명의 대학생 참가자들을 통해 실험을 하였다. 본연구를 통해 발견한 사실은 미디어에 적게 노출된 정보에 대해서는 군중의 지혜효과를 확인 할 수 있었으나 미디어에 많이 노출된 정보는 집단에서 발생하는 군중의 지혜효과를 저해하는 것으로 나타났다. 따라서 본 연구 결과는 교육정책과 사회학적 현상에 대한 연구에 많은 영향을 제공 할 것이다.

주제어 : 소셜 네트웍스, 사회현상에 대한 분석, 군중지혜효과, 싸이의 강남 스타일, 타블로 사건, 소셜미디어

Abstract The purpose of this study is to explain why the social phenomenon of the wisdom of the crowd does not empirically apply. The motivation of this study is to explain the Korean social issue: the Tablo incident. In this study, 50 university students participated in the experiments to assess the impact of social media on the wisdom of crowds effect. We find evidence of a positive wisdom of crowds effect, when respondents are less exposed to media. In contrast, the collective information seems to be negatively distorted by respondents highly exposed to media. This research has strong implication for education policy and theories of social interaction.

Key Words : Social networks, Analysis of the impact of social interaction, Wisdom of crowds effect, Psy's Gangnam Style, Social Media. the Tablo incident

1. Introduction

With the advent of social networks, social influence play an increasingly dominate role in human life. In modern society, information is abundant and rapid.

Various political and social scholars claim that there is a wisdom of the crowd effect because information is verification through multiple channels. This study examines through empirical experimentation the impact of media exposure on the wisdom of crowds effect.

Assessments of social impacts on the processing of information has a long history. In 1907, Francis Galten asked the public to guess the weight of a cow. Galten presents the closeness of the average of the guesses to the correct value as evidence of collaborative wisdom[4]. As illustrated by Galton, the public can reach a correct decision regardless of whether individuals are separately correct, well-informed, or rational. U.S. columnist James Surowiecki later named this ability as a wisdom of crowds effect[2][5][8].

In theory, the wisdom of crowds effect ensures the accuracy of data collected from a crowd. Information collected from large crowds is more accurate and logic than that from smaller groups. More recently, MIT university's cognitive scientist Edward and the California professor, Harold L Schuler Paesyul studied the effect of time on the accuracy of responses. They first asked 428 people what percent of the world's airports exist in the United States. After a few hours, they asked the same question. Consistent with intuition, the second response was more accurate due to the availability of more time for consideration[3].

In Jan Lorenz, Heiko Rauhut, Frank Schweitzer, and Dirk Helbing's study, published in 2011, explained how modern society is heavily socially interconnected and this social influence can add noise to information. They argue that a collective flow can distort information[1]. 144 students were surveyed to assess the wisdom of crowds effect, social influence effect, range reduction effect and confidence effect. This experiment was performed in a closed (isolated) environment: the participant was prohibited from connecting to the internet or communicating with others. They found that social influence can undermine the wisdom of crowd effect and the interval of decision-making was reduced by social influence and that the confidence effect increases the reliability of information[1][6].

Nowadays, social media such as SNS (Social Network Service) significantly impacts human life. People can easily access all kinds of information at a moment's notice[7]. The motivation of this study is to assess how social influences, such as SNS, effect the social phenomena, popular incidents.

The purpose of this study is to measure the extent to which social media impacts the wisdom of the crowd. Motivating this research is the 2010 Tablo incident in Korea. The incident may be described as a "witch-hunt." In a Witch-hunt, a minority of individuals begin rumors that rapidly spread. As the rumors build momentum, many blindly believe the information because of confidence in the crowd[9]. In the Tablo incident, rumors about the illegitimacy of Lee Seon-woong (Korean musician by the stage name Tablo) educational qualifications spread from a website. Membership on the website exploded to nearly 200,000 in only a few days. The rumors made front page news in Korea and negatively impacted the musician's career. In retaliation, Tablo sued ten Tajinyo netizen who spread the rumors of Tablo's education forgery theory in April 28, 2010. Three netizen members sentenced to 10 months in prison and other 6 members were sentenced in prison between 8 and 10 months with two year probation. The Tablo incident directly contrast with the premise of a wisdom of the crowd effect. This case shows how the few can disrupt the decision-making of a crowd by injecting the erroneous information.

In order to better understand the impact of social media on the wisdom of crowds, we develop the following hypotheses:
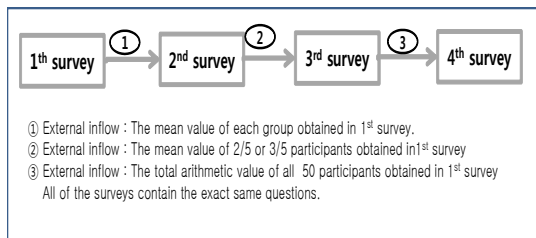
Hypothesis 1. The wisdom of crowds effect exist.

Hypothesis 2. External information is positively related with the respondent confidence, indicating that people believe in the wisdom of crowds effect.

Hypothesis 3. Media overexposure of information distorts collective information.

2. Experimental Methodology

In October 2012, 50 university students in South

Korea participated in this study. The 50 students were divided into 5 groups with each group consisting of 10 students. The survey contained 12 questions. The first 6 questions were challenging, but answerable, questions for the participants. The other 6 questions had no correct answer and could be classified as social matters, science, technology, political, economic, or cultural issues.

① External inflow : The mean value of each group obtained in 1st survey.
② External inflow : The mean value of 2/5 or 3/5 participants obtained in1st survey
③ External inflow : The total arithmetic value of all 50 participants obtained in 1st survey
  All of the surveys contain the exact same questions.

[Fig. 1] A description of the experimental process

This experiment was carried out as follows. Participants received no information about the questionnaire in advanced. The experimental environment for all participants prohibit the use of the internet, mobile phones, and interaction with other people in the classroom. The responses to the 12 questions on the questionnaire were written in a testing environment.

To measure the reliability and importance of each question, we developed a 6 tiered classification system, corresponding to 0%, 20%, 40%, 60%, 80%, and 100%. All of the surveys contain the exact same questions. However, the information sets of the 4 surveys varied. The purpose of this study is to measure the extent to which social media impacts the wisdom of the crowd. Therefore, participants were exposed to external information in the second survey. The same questions were used for all surveys as a control for comparability. The first survey group of 12 respondents received no inflow of external information. The second survey group received information on the group mean(arithmetic mean), obtained from the first survey.

For the third survey, participants belonging to groups 1~3 received their combined arithmetic mean of the 3 groups and asked to retake the survey. Similarly, groups 4~5 received their combined mean of the 2 groups and asked to retake the survey. In the fourth survey, all 50 students retook the survey with information on the total arithmetic value of all 50 participants, obtained in the primary survey.

Questions are as follows.
1. What is Seoul's population density in 2011?
2. How long is the border between North and South Korea?
3. What is the population influx of Seoul in 2011 ?
4. How many people are registered as a killer in Seoul in 2011 ?
5. How many people are prosecuted as rapists in Seoul in 2011?
6. What is the number of assaults were registered in Seoul in 2011?
   Following complete answer based on 100%
7. (Science) Do you think that extraterrestrial life exists in the universe?
8. (Technology) How much would the development of new technologies be delayed if the US closes its markets to Samsung's products?
9. (Technology) How much does SNS effect our lives?
10. (Politics) What is the probability that Mr. Ahn will be elected president in Korea in 2012?
11. (Economic) Will it be possible for the world to economically recover within five years?
12. (Culture) How much publicity do "Psy's Gangnam style" gain for Korea ?

Following measurement methods were used in this study. For a set of estimates Xi, where i=1,2,⋯n (n=50 in here) and the true value, we used the following measures to evaluate the impact of social influence on the wisdom of crowds effect. The mean(arithmetic mean in Table 2) is denoted by $x = \frac{1}{n}\sum_{i=1}^{n} x_i$

(mean(x) : mean of x, n=50) and the squared deviation of the average from the truth is. It also measured that the group diversity is the variance of estimates $\frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^2$, n is integer and i=1,2⋯,50. It implicitly defines the median is the appropriate measure of aggregation. In our empirical case, this works same way with the choice of the geometric mean as can be seen by the similarity of the geometric mean and the median.

3. The difference of previous research

This experiment was conducted with as similar questions as possible to that of the study by Jan Lorenz, Heiko Rauhut, Frank Schweitzer, and Dirk Helbing[1]. Our experiment is takes in consideration the information set of participants in Korea, relative to that of those in Switzerland. For example, we used the length of the line between the North and the South instead of the length of the border of Switzerland and Italy. Additionally, questions that have no correct answer in social matters, science, technology, politics, economy and culture were added to this study. Although the questions are challenging, they are certainly answerable. We classified the answers based on the amount of media exposure. We applied the same procedure for the other 6 questions, which had no correct answer. Another addition of our study is a question that measures the importance of the each question to the respondent, which may impact the effect of social media to the wisdom of crowds

〈Table 1〉 The difference between previous research and our study.

| Classification	Answerable	No answers exist	The answer confidence	Importance
Previous research	O	X	O	X
Our research	O	O	O	O

4. Analysis of experimental results

A. Crowd wisdom effect

Based on the results obtained from the first survey to 10 people, 20 people, 30 people, and 50 people, we can assess the impact of exterior information on responses.

〈Table 2〉 The data from the primary survey

Question	Correct answer (Truth)	Arithmetic mean	Multiple of correct answer	Maximum	Medium	Minimum	Standard deviation
Population density in Seoul	17,473people	9,384,827	53,710%	40,000,000	10,000,000	4	8,426,689
Koreas border length	248km	487	196%	10,000	110	2	1,497
Influx in Seoul(2011)	1,721,748people	1,718,363	100%	20,000,000	400,000	0	3,613,840
No of Killer(2011)	291 people	16,708	5,742%	300,000	500	1	49,220
No of Rapist(2011)	5,150 people	41,904	814%	1,000,000	750	1	170,364
No of Assault(2011)	72,051 results	351,971	489%	10,000,000	5287	1	1,564,084
Extraterrestrial life exists		49		100	60	0	34
US closes its markets to Samsung's products		45		100	50	0	24
SNS influence		75		100	80	10	21
Mr Ahn's chance of being elected president		47		100	45	9	22
World economic recovery		42		90	40	0	19
Psy's Gangnam style Influence		67		100	70	6	24
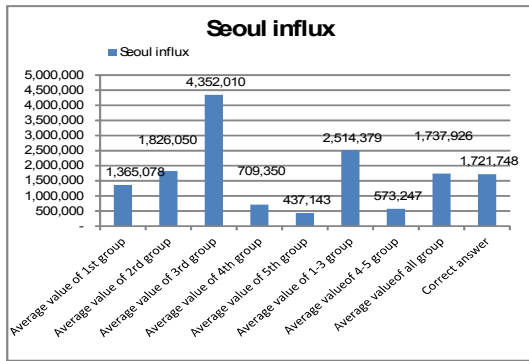
Seoul influx

[Fig 2] Seoul influx populations

Unfortunately, some students confused population density with the total population. Consequently, the group information was highly skewed and uninformative. In contrast, the length of the border between South and North Korea was straightforward and commonly known as 248Km. The average of the first group is 1,484 Km, correcting for seven participants who entered a value similar to the 10 million by misunderstanding the units. Except for the unusual values of group 1, the results of the 40 people in groups 2,3,4,5 almost match the correct answer, supporting the wisdom of crowds effect. This approximate correctness illustrates the intuitive concept of a wisdom of crowds effect.

From estimates of the Seoul influx population, we also confirm that the wisdom of crowds effect applies. The arithmetic mean answer of 50 people is 1,737,926 which is almost closed to the correct answer, 1,721,748. These findings support Hypothesis 1, "The wisdom of crowds effect exist." However, the estimated number of killers, rapists, and assaults in Seoul were considerably

higher than the true values. Since information about the murder, rape, and assault is mainly covered in the media, people have a skew perception of the commonality of the event. The true number of killers registered in Seoul 2011 is only 291 people, but the average responses of 50 participation is 18,133 people which is more than 62.31 time of the actual value.

We continue to observe these trends for questions that have high media exposure. Since the wisdom of the crowd seems to be adversely effected by media, we find evidence in support of hypothesis 3.

⟨Table 3⟩ Killers, rapists, assault data: responses and actuals.

Classification	Arithmetic value	Correct answer	Multiple of correct answer
Number of Killer	18,133	291	62.31 times
Number of Rapist	47,127	5,150	9.15 times
Number of Assault	355,632	72,051	4.93 times

The evaluation criteria of the 7-12 questions, which do not have an answer, provide information about the perceived importance of questions. The importance of questions about how SNS to affect our lives emerged as the highest (67%). Psy's Gangnam style was very fashionable at the time of the survey. Respondents valued the impact of Psy's Gangnam style on Korean publicity was 61%. The importance of the rest of the questions was less than 55%. Similarly, the respondents valued SNS influence at 80% and the influence of the Psy's Gangnam style at 73%. The remaining problem is 46-50% likely to close to intermediate value. According to the analysis of this survey, information distortion may have been highly

⟨Table 4⟩ The overall average and the importance of average obtained from the first survey.

Classification	extraterrestrial life exists	US closes its markets to Samsung's products	The influence of SNS	Mr Ahn's chance of being elected president	The possibility of economic recovery in the world	The influence of Psy's Gangnam Style
Overall Arithmetic mean	54 %	49 %	80 %	51 %	46 %	73 %
Importance Arithmetic mean	36%	48 %	67 %	63 %	55 %	61 %

prevalent on SNS and Gangnam Style, due to heavy measure exposure. In contrast, questions with a lower media evaluation at about 50% may benefit the wisdom of crowds effect exists.

In summary, we find that media exposure has a strong negative relationship with the wisdom of crowds effect. For questions that do not have an answer, we may estimate the effectiveness of crowd wisdom by measuring the level of media exposure. Since respondents attached media importance values around 73% and 80% to such questions, we may conclude that the crowd wisdom effect would be low.

B. Credible effect

To assess the credible effect, we look to questions 1-6. On the first survey, confidence levels for the answers varied between 12-27%, indicating a relatively low confidence of participants. In addition, we find credibility levels of about 27%-39% in the second survey, 35%-43% in 3rd survey and 39%-51% in 4th survey. The standard deviation of the confidence level falls from 5.13 to 3.6 over surveys. These findings support hypothesis 2.

⟨Table. 5⟩ The confidence of their answer about each information according to the external inflow trials.

Credibility average	1th survey	2rd survey	3rd survey	4th survey
Population density in Seoul	27	39	42	46
Koreas border length	14	37	43	51
Influx in Seoul	12	32	38	44
No of Killer	14	27	35	39
No of Rapist	14	31	36	42
No of Assault	13	31	39	44
Maximum	27	39	43	51
Medium	14	32	38	44
Minimum	12	27	35	39
Standard deviation	5.13	3.88	3.01	3.60
Arithmetic mean	**16**	**33**	**39**	**44**

Consistent with intuition, as the amount of external

flow information for the survey increases, the confidence of participants increases. As illustrated by table 5, this shows that people believe in the wisdom of crowds effect.

C. Importance effect

We find a strong connection between the importance effect and the exposure to social media. For topics sparsely covered by the media (social studies and science), there was relatively low importance responses of questions. Importance tended to increase more about social issues, with heavy media coverage. The important of the question are followings: murder (48%), rape (49%), assault (42%), SNS influence (67%), a presidential election(63%), and Psy's Gangnam Style (61%) that are interested at the time of the survey.
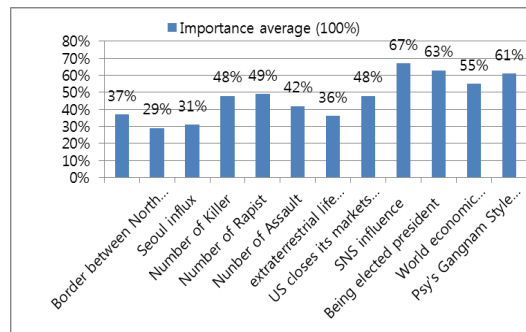

[Fig. 3] The arithmetic mean for the question on the importance.

5. Conclusion

The purpose of this study is to measure the extent to which social media impacts the wisdom of the crowd. The 2010 Tablo incident in Korea motivates this research. The results of this study indicate a negative relationship between social media exposure and the wisdom of the crowds effect. In particular, questions with excessive exposure to the media can be easily distorted by external inflows of information,

undermining the wisdom of crowd effect. In here, we proved the similar idea of Jan Lorenz, Heiko Rauhut, Frank Schweitzer, and Dirk Helbing's study, explained how modern society is heavily socially interconnected and this social influence can add noise to information.

In particular, we find evidence for that support our three hypotheses. There is a wisdom of the crowds effect. This effect is illustrated by questions about topics, such as the Seoul influx in 2011, with a minimal social media impact. However, the effect is diminished in the presence of social media. Further effects of social media include increased confidence in answers and a relatively higher importance valuation. The implications of this research are important for cases assessing the accuracy of crowd based data and information processing. In particular, these findings give insight to events such as the Tablo incident by our experiment and on this survey. Tablo incident, the rumors of Tablo's education forgery is best example that media exposure misleading the crowd. Similarly, we found evidence from our experiment that people misjudge the importance of social media events. For instance, many responded that Psy's Gangnam Style gave a lot of publicity for Korea, when the publicity was more so focused on Psy.
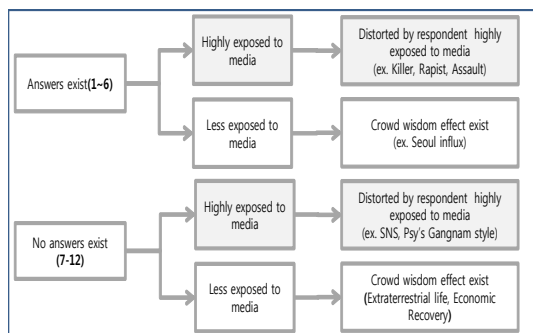
[Fig. 4] Findings profiles

This study focused on the finding of a negative relationship between social influence and wisdom of crowd effect. The limitations of this study is only 50 university students participated. In order to get more accurate results more participants should be joined the survey. Future research areas include: how much social influence impacts the wisdom of crowd effect, especially from different spatial angles.

ACKNOWLEDGMENTS

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