

온라인 인포그래픽 뉴스의 커뮤니케이션에 관한 연구

A Study on News Graphic Design in Social Media

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요약

뉴스 이용자들이 뉴스를 읽는 방식이 신문에서 스크린으로 바뀌고 있다. 옥스퍼드 대학 로이터 연구소의 2017년 연구에 따르면 뉴스 소비 중 온라인을 이용하는 비율이 꾸준히 증가하고 있으며 미국인의 51% 이상이 소셜미디어를 통해 뉴스를 받아보고 있다. 반면에 신문 구독률은 빠르게 줄어들고 있다. 선행연구에 의하면 문자정보의 이해도는 스크린에서보다 인쇄매체에서 더 높게 나타난다. 온라인 뉴스 매체들은 양질의 뉴스를 전달하기 위해 인포그래픽 뉴스 서비스를 제공하고 있다. 따라서 본 연구에서는 뉴스에서 인포그래픽을 사용하는 것이 독자에게 미치는 영향을 이해하고자 했다. 이를 위해 세 가지 실험이 수행되었다. 인포그래픽의 이해도는 매체에 따라 어떻게 다른지 실증 분석한 결과 스크린보다 인쇄매체에서 이해도가 더 높은 것으로 밝혀졌다. 연구 결과에 따르면 뉴스에서 인포그래픽을 사용하면 인지 효과와 수용의도 측면에서 사용자에게 긍정적인 영향을 미친다. 인쇄 뉴스와 비교할 때 온라인뉴스는 이해력 면에서 효과적이지 않다. 온라인 인포그래픽의 디자인 유형에 따라 퀴즈 정답률에는 차이가 없었지만 지각된 이해도에서는 유의미한 차이가 발견되었다.

■ 중심어 : | 커뮤니케이션 | 디지털 디자인 | 인포그래픽 | 정보디자인 |

Abstract

The way people read news is changing, from print to screen. In this study, we aimed to understand the impact of the use of infographics in news on readers. According to a study conducted by Reuters Research Institute at the University of Oxford in 2017, the proportion of online consumers of news is steadily increasing, with over 51 per cent of Americans receiving news via social media. Additionally, newspaper subscription rates are rapidly declining. According to previous studies, the understanding of text information is higher in print media than on screen. Therefore, to compensate for the weaknesses in the understanding of online news, online news media are providing infographic news services to deliver good news. Therefore, this study attempted to understand the impact of using infographics in the news. To this end, three experiments were conducted. The findings from the study indicate that the use of infographics in news has a positive effect on users in terms of the variables measured, including cognitive effect and acceptance of news. As compared with print news, on-screen news was not as effective in terms of comprehension. However, we propose interactive infographics to enhance communication effect along with improved design.

■ keyword : | Communication | Graphic Design | Information Design | Digital Design | Information Processing |

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I. Introduction

Users voluntarily choose online news. According to a study conducted by Reuters Research Institute at the University of Oxford in 2017, the proportion of online consumers of news is steadily increasing, with over 51 percent of Americans receiving news via social media. Additionally, newspaper subscription rates are rapidly declining[1]. When users access news through print newspapers, television, or magazines, they receive high-quality news, curated by experts. However, users react to news on social media depending upon their tastes and moods, and the news is exposed or shared immediately. Through social media, users share the immediate emotions and reactions they have in response to the news. As compared with traditional information sharing, in virtual communities, the status update in microblogs is more spontaneous and less rational, and herein lies the problem. Because the news on social media is shared by the feelings and experiences of individuals[2]. It is, therefore, not reliable enough. Moreover, in terms of understanding the news, the printed form is more effective as compared with a screen[3-5]. Online consumers of news do not read as much as they do when they read newspapers. Unlike newspapers, social media is influenced by immediate user reactions. The news on the timeline is chosen, and the frequency of exposure varies. Unlike in the past, when expert edits were made, users are forced to choose news according to their moods and preferences, resulting in a high number of clicks and low quality of information. In addition, social media is changing its interface by first exposing pictures

and videos rather than text information in order to grab the user's attention. As a result, online news media aims to deliver high-quality information by utilizing photos, videos, card news, and infographics. This study answered the following research questions:

- Q1. Do infographics differ in their effect on information transfer while reading on screen and reading on paper?
- Q2. What is the hierarchical effect of information processing on screen infographics?
In other words, what is the relationship between the attitude toward infographics, the perceived cognitive effect, and the acceptance intention?
- Q3. How does the actual comprehension of infographics differ from the perceived comprehension of the reader?

With the number of online news readers exceeding that of newspaper readers, solving the research questions would make it possible to search for ways to convey important and meaningful information to users. Irrespective of whether or not elaborately designed infographics can help users understand what they want to do and whether or not users want to read and share quality news, it is time to consider the direction to design news.

2. Literature review

2.1 Media and information acceptance

In information society, information consumption is changing more actively. This is because it is moving away from the conventional, uniform, and concentrated forms of information consumption, and recognizing and accepting smaller and diverse forms[6]. In particular, in a

social media society where users actively select media, it is important to understand the characteristics of media users, such as their innate desires, and develop content and services to meet their needs.

Along side the development in technology, there is also a deluge of information. Users are accustomed to grasping the essence of the text on the screen and quickly reading and processing it. Kong et al. (2018) conducted a meta-analysis of 17 papers to compare comprehension and reading speed on screen and on paper[5]. There was no difference in reading speed. However, the reading comprehension on paper was better than on screen. In their study, Mangen et al. (2013) also found that students who read text in print score significantly better on the reading comprehension test than those who read digitally[4]. Ackerman and Lauterman (2012) investigated the effects of time limits on reading on paper and on screen[3]. Irrespective of the time limit and even in situations where reading is interrupted, reading on paper was found to be more effective in comprehending the content than reading on screen.

In reality, however, the challenge with reading is not simply comprehension. In the case of online news, the pressure to receive clicks and be shared can affect news selection[7]. According to Taloussanomat, a Finnish economic newspaper that moved from print to online, the medium itself and not the content it provides determines the consumption pattern of news. In online news, the number of visitors influences news planning[8]. Therefore, when a media organization decides to move its services from print to online, the scope of reporting more stimulating and sensational content increases.

While reading on paper is found to be better for comprehension, users now read the news on the screen. In the future, the number of users reading the news on the mobile phone, the tablet, and other devices will increase. This is leading news providers to give users easy access to high quality information on screen.

According to Pippis, Walter, Endres, and Tabatcher (2009), when readers recall news they read online, the news having pictures and graphic elements are recalled more easily than those with text alone[9]. Online news employs various visual elements such as photographs, illustrations, charts, and maps, to enhance the interest and understanding of readers[10]. De Haan, Kruikemeier, Lecheler, Smit, and van der Nat (2017) in their i-tracking study of three different news platforms, that is, paper, tablet, and Web page, visualized news, regardless of the platform[11]. It was found that the news was evaluated positively when the visualization was easy to understand and consistent with the content of the article.

2.2 New media and infographics

In providing news, the media, the ways, and the content has now gained importance. Infographics is a composite term for information and graphics. According to Doosan Encyclopedia, infographics are a combination of information and graphics, which conveys complex messages concisely. Information is created by combining and analyzing data, which is a plural form of the Latin word datum, meaning data, material, and argument. In computer terminology, it means the data necessary for creating information. According to the standard Korean dictionary, information is distinct from data. "Information" refers to

knowledge or statistics organized to help you clarify the “data” collected through observation or measurement.

Infographics are being used effectively in news. Infographic news gained popularity as foreign media companies such as Time magazine and USA Today, used infographics to simplify complex content through various methods. The use of infographics as news articles has expanded the range of information that is available to readers[12][13].

In Korea, the use of infographic news began in 2010 with the launch of infographics, a new concept news service, by Chosum.com. Yonhap News too provides infographic news such as graphic news and interactive news, in the visual news section of the website. Users can input simple data directly through the data site. It provides a service to create infographics. Visual Dive, launched in 2013, is a new concept of infographic and visual media. Unlike existing media companies, Visual Dive produces and supplies all information in infographic and visual form. If the old version of infographics was used as an aid to help understand news, the new version is being used as news and dominating social media and infographic news sections. Research by T. Y. Kim and J. Y. Park suggests that readers need bottom-up attention caused by stimulation in order to select articles. The nature of bottom-up attention is deeply related to the formative principle because it is dominated by the external form of the article and not the content element such as the material or subject[14]. When content is difficult to read, readers can use the infographics in the article to understand the essence[15]. Readers with low knowledge of or involvement in news show a more favorable

response to news that has infographics[16].

People form a liable first impression of the appeal of an infographic, based on a mere exposure effect. Therefore, engagement and memorability might be determined much earlier than previously thought[17]. The entertainment in news infographics has a positive effect on the acceptance and the perceived cognitive effect of information. In addition, interactive infographics are positively evaluated in terms of entertainment, reliability, and informativeness as compared with non-interactive infographics [18]. Even when the same news is being put out, the chances of becoming the reader's choice vary, depending on the media, and journalists are working in an environment where their readers are forced to choose. These changes have the side-effect of producing stimulating, low-quality news. Relatively difficult and important news may be ignored. The advantage with infographics is that users can easily grasp high-quality, complex information. Therefore, in order to clearly understand the strengths of communicating using infographics and to be able to use these in a goal-oriented way, research is required to enhance the effect of infographics in communication and to make the design consistent with the purpose.

3. Methods and analysis

3.1. Research procedures and inclusion criteria

The acceptance of information in print and on screen is significantly different. Although reading in print is more effective in terms of comprehension, the actual rate of consumption of online news is increasing overwhelmingly. Social media news is influenced by feedback

from the news planning stage to be selected by the readers. So, we decided to find a way to provide better news to readers in a more selectable format.

Online infographics are being actively shared around the world as images are shown to be more effective for communication than text. Therefore, we propose infographics as a way to make it easier for readers to communicate

Table 1. Operational Definition of Evaluation Items

Measure	Description
Entertainment	The amount of enjoyment gained through the infographics
Reliability	The reliability the user feels about the information portrayed in infographics
Informativeness	The amount of social and personal benefits gained through infographics
Attitude	The extent of positivity or negativity that a user feels to perceived information
Cognitive effects	The perceived extent of how well the contents of the infographics are delivered to the user
Acceptance intention	Intention to accept the information and save, recommend, or share it

difficult information online. Our previous study confirmed that users’ reactions to infographics, regardless of whether they are interactive or not, are mostly positive, and that the use of infographics plays a positive role in communication.

In this study, we conducted three experiments about infographics. First, we compared how the effect of infographics on reading in print and reading on screen differs.

In the second experiment, we examined how information processing of infographics is accomplished through AMOS analysis.

Lastly, we measured the user’s comprehension by the recognition test and their perceived cognitive effect.

We used six metrics. “Informativeness”, “entertainment” and “reliability,” including emotional cues were selected as factors affecting the value judgment of infographics [Table 1].

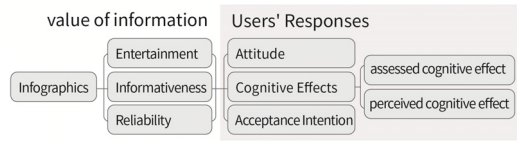


Figure 1. Evaluation items

The attitude toward web advertising is based on the theory of technology acceptance and is the method used to measure the effectiveness of advertising with the recent increase in social media and web[19]. It is assumed that entertainment, information, and credibility affect advertising value and that advertising value affects advertising attitude. According to a study by won (2018) that comprehensively analyzed the AIDA model, DAGMAR model, Lavidge Steiner model, and McGuire model, according to the information processing process at the receiver's end, the cognitive stage, which is exposed to information, and the affective stage, which has appeal or desire, leads to the behavioral stage. In this study, we distinguished the degree to which it is easy to understand infographics as “perceived cognitive effect” and “assessed cognitive effect”. The assessed cognitive effects were measured by solving quizzes, and perceived cognitive effects were measured using questionnaires in which users self-diagnosed the understanding.

3.2 Participants and apparatus

The survey was conducted on a pool of college students in Seoul and Chungcheong area, from March 24 to April 7, 2015. A total of 954 participants participated in the paper survey, and 252 respondents participated in the screen survey.

For experiment1, participants were 50 respondents of the print survey and 84 respondents of the screen, and they were

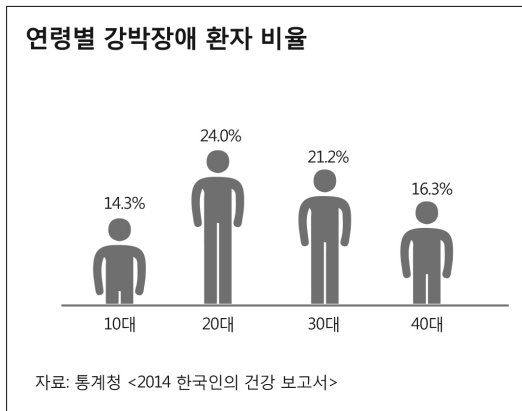


Figure 2. Experimental stimuli

provided with the same infographic.

For experiment2, the results of 954 participants were analyzed.

For experiment3, the design representation of the infographics, resembling reality, was divided into four stages, and 238 respondents participated in each group. All respondents used paper questionnaires.

3.3 Experiment1: Difference in media

In order to answer our first research question, we gave the same experimental stimuli to both groups of participants, on screen and in print. Experiments were conducted using questionnaires on screen and questionnaires in print. The experimental stimulus was the same as the bar graph news designed as a human figure [Figure 2]. We examined the results of the two experiments to determine the difference in communication when the same infographic was presented through different media. Significant differences were found in entertainment, attitude, cognitive effect, and acceptance intention. In addition, infographics in print showed high results in all survey items. Today's news users are more likely to read news on screen than to read it in the newspaper.

However, previous studies have found that reading a newspaper better understands the news than reading it on the screen.

Table 2. The difference between the media that provided the infographic

Variables	Group	N	mean	Std. Deviation	F	df	Sig.	Eta-Squared
Entertainment	print	50	4.947	1.334	33.274	1, 132	0.000**	0.201
	screen	84	3.627	1.249				
Informativeness	print	50	3.726	1.360	0.692	1, 132	0.407	0.005
	screen	84	3.548	1.097				
Reliability	print	50	3.994	1.336	0.125	1, 132	0.725	0.001
	screen	84	4.067	1.054				
Attitude	print	50	4.507	1.469	10.041	1, 132	0.002**	0.071
	screen	84	3.786	1.143				
Cognitive Effects	print	50	5.139	1.346	30.321	1, 132	0.000**	0.187
	screen	84	3.952	1.116				
Acceptance Intention	print	50	3.746	1.615	5.862	1, 132	0.017**	0.043
	screen	84	3.131	1.296				

3.4 Experiment2: Hierarchy of communication

In order to answer the second research question, we formed two hypothesis.

H1: The results of the evaluation of infographics will affect the overall acceptor reaction.

H2: The attitude and cognitive effect of the audience response will influence the acceptance intention.

These hypothesis were tested through structural equation modeling, which has the following advantages: the measurement error can be controlled, the parameters are easy to use, and the statistical evaluation of the theoretical model is possible. The statistical package AMOS was used for the verification through structural equation modeling. The fitness of the model was evaluated through RMSEA, TLI, and CFI. According to Hu and Bentler (1999), the RMSEA value is a fair fit 0.08 or less, and for TLI and CFI, the values of 0.9 and above are good [20]. It can be seen in [Table 2] that the fitness of the research model was satisfactory.

Table 3. Fitness of Research Model

	χ^2	df	CFI	TLI	RMSEA
Model	782.476	120	.937	.920	.076

As the suitability of the research model was verified, the hypothesis of this study were verified through the path coefficient estimated through the research model.

Table 4. Parameter Estimates of Models

	Estimate
f4(Attitude)→ f1(Entertainment)	.358(.292)***
f4(Attitude)→ f2(Informativeness)	.315(.209)***
f4(Attitude)→ f3(Reliability)	.249(.251)***
f4(Attitude) → f5(Cognitive Effects)	.391(.385)***
f5(Cognitive Effects)→ f1(Entertainment)	.539(.447)***
f5(Cognitive Effects)→ f2(Informativeness)	.235(.155)***
f5(Cognitive Effects)→ f3(Reliability)	.238(.244)***
f6(Acceptance Intention)→ f1(Entertainment)	.201(.130)*
f6(Acceptance Intention)→ f2(Informativeness)	.886(.465)***
f6(Acceptance Intention)→ f3(Reliability)	-.096(-.077)*
f6(Acceptance Intention)→ f4(Attitude)	.348(.276)***
f6(Acceptance Intention)→ f5(Cognitive Effects)	.079(.061)

note. Numbers are nonstandardized coefficients and standardized coefficients are given in parentheses. * P<0.05; ***P<0.001

Table 5. Direct, indirect and gross effects of key variables

Independent variables	dependent variables	Direct effect	Indirect effect	Gross effect
f1(Entertainment)	f4(Attitude)	.292***	.173*	.465
	f5(Cognitive Effects)	.450***	.000	.450
	f6(Acceptance Intention)	.130*	.154*	.284
f2(Informativeness)	f4(Attitude)	.209***	.060*	.269
	f5(Cognitive Effects)	.155***	.000	.155
	f6(Acceptance Intention)	.465***	.083**	.547
f3(Reliability)	f4(Attitude)	.252***	.094*	.345
	f5(Cognitive Effects)	.244***	.000	.244
	f6(Acceptance Intention)	-.076*	.109*	.033
f5(Cognitive Effects)	f4(Attitude)	.384***	.000	.384
	f6(Acceptance Intention)	.060	.105*	.165
f4(Attitude)	f6(Acceptance Intention)	.273***	.000	.273

note. Significance of indirect effects * P<0.05; **P<0.01; ***P<0.001

With the parameter estimates presented in [Table 4], it was confirmed that entertainment, informativeness, and reliability, which are the value evaluation factors of infographic, had a positive effect on attitude and cognitive effect. Entertainment and informativeness had a positive effect, and reliability had a negative effect on acceptance intention. The path

coefficient was 0.105 (.384 * .273)when the cognitive effect had an effect on the acceptance intention through the attitude. When the cognitive effect directly affected the acceptance intention, the path coefficient was 0.060. As a result of checking the significance of the indirect effect with bootstrap, it can be confirmed that the cognitive effect may have a significant influence on the acceptance intention when the attitude mediates[Table 5].

3.5 Experiment3: Perceived cognitive effects and tested cognitive effects

In order to answer the third research question, we formed hypothesis.

H3: There will be a statistically significant difference between perceived cognitive effect and quiz-cognitive effect.

we conducted a quiz on the content of the infographic in the questionnaire. The objective of the quiz was to observe how user reaction varies according to the degree of resemblance of the infographic design expression with the real object [Figure 4]. In this experiment, the cognitive effects were measured from two measurement:

M1. The cognitive effect that can be confirmed by the correct answer rate of the quiz

M2. Perceived cognitive effects that respondents rated themselves on the 7-point scale

M1 is a quiz-cognitive effect, and M2 is a perceived cognitive effect to prevent confusion.

The quiz-cognitive effect was verified by the cross-comparison analysis using SPSS18, and the results were not significantly different to prove the detailed hypothesis that there will be a difference in quiz correct rate depending on the type of infographic design.

The perceived cognitive effect was verified by

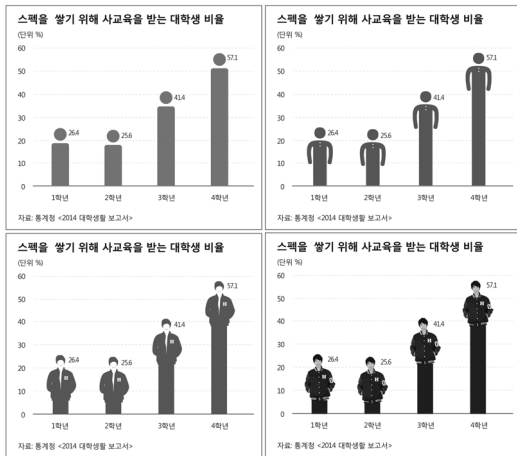


Figure 4 Derived Structural Equation Model ; upper-left(L1), upper-right(L2), Bottom left (L3), Bottom right(L4)

the univariate analysis using SPSS18, and the hypothesis that there will be a difference of cognitive effect according to the design type of infographic was verified, thus confirming the third research hypothesis that there will be a difference between the cognitive effects in the reincarnation test and the perceived cognitive effects of the users themselves.

As presented in [Table 6], no statistically significant differences exist between the type of design static expression and the quiz cognitive effect, so that even if the design is differentiated, it does not help to recognize the contents of the infographic immediately. However, perceived cognitive effects show different results.

As shown in [Table 7], a statistically significant difference was found between the types of design static expression and the perceived cognitive effects ($F = 3.395, df = 3, 948, p < .05$). L4 showed a significant difference between L1 and L2, indicating a significant difference in the degree of design and cognitive effects when clearly differentiated. As compared

with L4, which was designed to resemble the real object, and L1 or L2, which is a low level of description, the details of the depiction made it easy for the users to remember and understand[21].

Table 6. Relationship Between Design Types and Quiz Cognitive Effects

	Questionnaire Type(Similar to reality)			
	L1	L2	L3	L4
Incorrect answer	83 34.9%	88 37.0%	91 38.2%	67 28.2%
Correct answer	155 65.1%	150 63.0%	147 61.8%	171 71.8%
Total	238 100%	238 100%	238 100%	238 100%

$\chi^2=6.368 \quad df=3 \quad p>0.05$

Table 7. Relationship Between Design Types and Perceived Cognitive Effects

Group	N	mean	Std. Deviation	F	df	Sig.	Eta-Squared	Post verification
L1	238	4.013	1.130	3.395	3,948	0.000	0.019	L1/L4 L2/L4
L2	238	4.014	1.208					
L3	238	4.261	0.992					
L4	238	4.354	1.054					

Therefore, it was found that the design type has no effect on the quiz-cognitive effect and that it affects the perceived cognitive effect, which supports the H3 that there will be a difference between the two cognitive effects.

4. Discussion and conclusion

Based on our findings in this study, we suggest the following guidelines for using infographics in presenting news on the screen.

1) **The communication effect of infographics** should be supplemented in the screen environment. Experiment 1 shows that even in the case of infographics, reading in print is more effective than reading on screen. Nevertheless, reading on screen is expected to increase steadily as users change their media

environments. Therefore, continuous efforts are needed to improve the communication effect in screen reading. According to the design type of interactive infographics, the audience positively evaluates informativeness and entertainment, which shows a positive correlation with the audience's attitude, cognitive effects, and acceptance intention (Won, 2018). Therefore, communication effects can be further enhanced by using interactive infographics in online news, the type that are not available in print news.

2) In a screen environment, the design needs to be more fun, reliable, and interactive.

The user emotionally judges whether or not to share information. As per the information hierarchical effect analysis in Experiment 2, it can be seen that the cognitive effect positively influences the acceptance intention through the attitude. You can change the attitude of the user more positively by making the graphical design of the infographic more interesting, using the interactive infographic, or using other methods. This positively affects the acceptance intention to share or store information. The popularity of Internet news can be a new standard for evaluating news. Difficult and serious news has become an important subject for news design that can impact the attitude of users positively.

3) Infographic design plays a positive role in determining the perceived cognitive effect of the user. In Experiment 2, the judgment of entertainment, informativeness, and reliability of the infographic are changed according to the design, which positively affects the perceived cognitive effect of the user. Cognitive effects do not directly influence acceptance intentions, but they can enhance acceptance effects

positively via attitudes. In Experiment 3, the change in the design of the infographic did not bring about any significant change in the quiz effect but affected the perceived cognitive effect positively. Users in the era of social media share and store the information they find useful or interesting, even if they do not grasp the information right away. Therefore, the perceived cognitive effect is as important a variable as the quiz cognitive effect in terms of information diffusion. Even if the quiz is not solved, it is meaningful that the perceived cognitive effect is high owing to the characteristics of mobile media users.

4.1. Conclusion

In this paper, three experiments were conducted on the news infographic. Experiment 1 confirmed that not only text news but news with infographics in print too are more effective for communication than news on screen. Experiment 2 confirmed the hierarchical effects of infographic communication and confirmed that differentiated designs could positively influence audience response. In Experiment 3, We have found that design has a significant effect on perceived cognitive effects.

The practical implications of this study are as follows. In online news flooded with low-quality news, we found that infographics can be used to generate more positive responses to audiences. Research has shown that infographic design can have a positive impact on audience response, so we can make quality news easier for people to understand and more people to read and share.

In our third experiment, we also found that, in infographic news, there is a difference between what people actually remember and

what they think they know. Users exposed to huge amounts of information online can easily store and retrieve it at any time. Therefore, even if the user does not remember the information exactly as before, the user can retrieve the information again as if recalling the memory just by knowing where the information is located. Therefore, distinguishing cognitive effects from quiz cognitive effects and perceived cognitive effects suggested a new standard for evaluating cognitive effects according to the user's news usage situation.

4.2. Limitations and future works

In this study, we conducted three small experiments to find meaningful insights to improve the quality of on-screen news and make it available to more users. By identifying how the perceived cognitive effects differ from the cognitive effects evaluated by the quiz, the paper could be completed in relation to changes in the news media. Since the experiment lacked thoroughly planning from the beginning, the number of participants in each experiment was different. Experiment 1 had 252 participants, Experiment 2 had 954 participants, and Experiment 3 had 952 participants.

In the future, I would like to investigate how to use infographic as a way of observing the news usage behavior of infographic news sites or actual online news consumers on the social media. In this study, we confirmed that there is a difference between perceived cognitive effects and quiz cognitive effects, but we are not sure whether the audience can accept the news based on the perceived cognitive effects. Therefore, it is necessary to verify the usefulness of infographic news by checking the

impact of perceived cognitive effects on news use and the news recall over time.

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