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CLICK-THROUGH RATES AND CONSUMER SATISFACTION: A PILOT STUDY ANALYZING THE PREFERENCES OF SOUTH KOREAN ONLINE NEWS CONSUMERS

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ABSTRACT

Consumers often respond negatively to news information owing to a lack of information in notification messages. This pilot study compares consumer satisfaction and click-through rates between an existing application and our newly-developed news notification application that shows emoticons and text summaries. Eighty South Korean adults with prior experience in using news notification applications were randomly divided into four groups of 20 for this study. One of the following conditions of receiving news notifications was assigned to each group: news without additional information, news with emoticons, news with text summary, and news with both emoticons and text summary. We found that the average click-through rate and average satisfaction score were significantly higher among participants who saw the additional text summary. Similar results were observed for consumer satisfaction and visualizing emoticons. Our findings indicate that information abundance increases consumer satisfaction. Mobile technology that provides information delivery methods that complement consumers' needs may lead to higher consumer satisfaction levels.

Keywords: consumer satisfaction, click-through rate, information consumer, media richness theory, news notification application

1. INTRODUCTION

Many people utilize mobile devices to consume news and consider information to be a consumer good. News consumption using mobile devices is becoming a common daily activity, regardless of age and income level. The Pew Research Center reported that the use of mobile devices for reading news articles grew from 54% in 2013 to 85% in 2017 [1], with the trend especially increasing among adults 50 years or older and low-income households [1]. This highlights the advancement of information processing and mobile technologies that facilitate consumer access to news sources [2-4].

The increase in online news consumption has brought about consumption-related issues, such as the filtering of trustworthy news articles [5]. Owing to a plethora of news sources, including social news and citizen journalism—which are enabled by technological advancements [6], people are faced with the risk of consuming fake, manipulated, or alternative news [7]. Moreover, with the sheer number of sources, governments are struggling to control news suppliers and their diverse contents. News articles on social media (e.g., Facebook) and portals (e.g., Yahoo News) are particularly difficult to control because they are based on liberal and democratic communication methods.

In South Korea, traditional news providers and their printed publications are regulated by the Act for News Publisher and Promotion, however, the regulation was executed with limitations because overregulation would have triggered a political debate on the curtailing of press freedom [8]. New regulations on alternative news sources (e.g., social media and portals) have been suggested and discussed in South Korea since 2015 [9], however, political debates surrounding the issue of press freedom have hindered their implementation [8]. As a result, the spread of fake or manipulated news has become rampant in the country, which has led to severe criticism from all quarters regarding how consumers are exposed to information without the necessary regulations [10].

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South Korean news portals have been criticized because numerous consumers currently consider them as their main news source. Specifically, consumers in South Korea frequently criticize Naver (a market-dominant news portal) for not being politically neutral, claiming that it sporadically manipulates information for the benefit of specific political parties [11]. However, Naver is not technically a news producer, but merely a news portal; it only publishes varied articles, including news articles and blog posts. Therefore, the regulations for news producers are often not applicable to portals such as Naver, hindering governmental capacity to control the news delivered through social media and news portals [12]. Therefore, when filtering news, current consumers may need to be more discerning than those who consume news from traditional providers (e.g., newspapers and magazines), especially when using sources such as Naver.

This reality may lead people to consume information from unreliable news articles, which may diminish their satisfaction with such sources. As many South Koreans use smartphones and computers to read news articles [13], they are more likely to be exposed to fake/biased news through diverse news channels [10]. Therefore, we assumed that South Korean consumers may be experiencing decreased satisfaction with news applications owing to a greater pre-existing likelihood that they will be exposed to fake news.

Prior research shows that the current notification messages on news applications lack a consumer-centered approach and do not consider consumer needs in their services [14-16]. Generally, such applications (apps) provide notification messages containing only the news title, and disregard any other potentially relevant information that could arouse consumer interest and increase their satisfaction with the news app. Given this information deficit, we determined that there is a need for a notification service that enables consumers to capture the main points of news articles by including emoticons (e.g., those expressing anger, sadness, or happiness) and/or short summaries in the notifications.

To address the aforementioned need for increasing consumer satisfaction with news information consumption, we developed a notification service app and tested it with a consumer sample. The app was designed to display news article details based on consumers' interests. Accordingly, this study aimed to compare consumer satisfaction and click-through rates (CTR) between new and existing news notification apps in South Korea. By conducting such an analysis, we aim to understand whether including detailed information in articles in the notification messages of news apps increases consumer satisfaction.

Our study contributes to academia and the industry in two ways. First, our findings support the media richness theory (MRT), which posits that detailed information increases consumer satisfaction. Our addition of relevant information through an enhanced version of notification messages (i.e., adding emoticons and text summaries) should provide enough support for the validity of this theory. We believe that the MRT model can be used to improve consumer satisfaction in the online news industry. Specifically, a greater abundance of information may lead to higher satisfaction. Second, our findings can raise the awareness of stakeholders regarding the need for industrial efforts to increase consumer satisfaction by developing mobile technology. Further, our developed app enhancement does not require high-end technology. Instead, it is a simple technological solution that enhances the visualization and balance of information exposure. In other words, we believe that simple yet creative efforts to increase information abundance may support the information industry's success and enhance consumer satisfaction.

2. CONCEPTUAL BACKGROUND

2.1 MRT and Visual Information/Emoticons
The information industry (e.g., news, social media) has introduced notification systems to increase information conveyance. However, these systems are not the best solution because the inclusion of different and numerous notification services has led users to identify most notification messages as spam [17], thus lowering consumer satisfaction.

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Specifically, news providers have access to a large amount of information, whereas consumers tend to have access only to certain information. This allows news providers to intentionally manipulate headlines (e.g., forward referencing), regardless of article content. Consumers who read news articles with manipulated headlines are generally less satisfied with the corresponding news services [18], [19]. Eventually, after multiple low satisfaction experiences with news information consumption, consumers stop accessing news articles, despite viewing interesting headlines. The MRT posits that having multiple channels for consuming news information increases consumer satisfaction [20], [21]. Research shows that current news delivery methods may be failing to maximize consumer satisfaction, which is our study's main focus. We, therefore, aim to develop an enhanced news delivery service through an improved notification message system.

Despite the thorough use of linguistic messages in current notifications for news apps, the MRT posits that multiple channels should convey information using diverse formats, including linguistic, as well as non-linguistic, formats. For example, emoticons (i.e., a visual, non-linguistic format to convey information) are conceptualized as facial expressions that convey the user's feeling or intended tone [22]. Research shows that emoticons may be useful in the context of news. Specifically, Hsieh and Tseng [23] combined linguistic messages and emoticons for information provision, thereby increasing channel abundance using multiple media. They verified that providing abundant information enhanced social interactions. Further, Walther and D'Addario [24] described how the use of emoticons contributed more to information transmission than simply using linguistic content. Additionally, Daniel and Camp [25] studied how using emoticons affects the perception of social media communication. They showed that adding adequate emoticons facilitated user understanding and information credibility. Therefore, the existing literature supports the finding that when information delivery is limited (e.g., in notification messages), emoticons can reinforce positive/negative connotations of the relayed content.

Hsieh and Tseng [23] and Forbes and Buchanan [26] confirmed that text with emoticons made users more comfortable compared to text without emoticons. We aimed to expand on this finding by including both a textual summary and emoticons in notification messages, while also setting the user's mood/attitude. Furthermore, in the context of e-commerce, the reactions evoked by visual information, especially emoticons, differ by users' social norms [27]. Upon using emoticons for advertising initiatives, trade-oriented customers who only receive the paid service before leaving the store showed negative reactions toward emoticons, stating that the corporate image/attitude of the customer service manager seemed lacking. Nonetheless, community-oriented customers who hope to receive a service and interact with the company/store reported feeling the enthusiasm and warmth of the company when seeing the emoticons in the advertisement (ad) [27].

2.2 News Notifications in Mobile Technology
News notification messages are a type of commercial service. Based on the evidence presented earlier, providing additional information such as emoticons in such messages may lead to user satisfaction or dissatisfaction, depending on their personal traits. Therefore, we chose to measure consumer satisfaction in terms of personal traits. Russell and Mehrabian [28] referred to an emotional model in software development to advance existing emotional analysis while considering emotion as "energy" (arousal) and the positivity/negativity (valence) of an emotional assessment [29]. We determined appropriate emoticons for each emotion based on this study.

The literature has investigated user fatigue from excessive online information mostly using online ad click data. Specifically, higher user fatigue led to lower ad CTR [30]. Using CTR, we set user reaction as the dependent variable, which was verified by users clicking on different information provided in news articles. Therefore, we measured CTR to assess consumer satisfaction.

2.3 Research Questions and Hypotheses
Our main research question is as follows: How do news notification messages containing emoticons and textual summary information affect users' satisfaction compared with notification messages that do not contain them? Accordingly, we propose the following hypotheses, which were assessed using CTR and satisfaction scores:

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- **Hypothesis 1 (H1):** News notifications with emoticons will ensure an abundance of information compared to notifications without them, thus increasing consumer satisfaction.

- **Hypothesis 2 (H2):** News notifications with summary information will ensure an abundance of information compared to notifications without them, thus increasing consumer satisfaction.

- **Hypothesis 3 (H3):** News notifications with emoticons will ensure an abundance of information compared to notifications without them, thus increasing consumer click-through-rates.

- **Hypothesis 4 (H4):** News notifications with summary information will ensure an abundance of information compared to notifications without them, thus increasing consumer click-through-rates.

To assess whether consumer satisfaction was enhanced, the hypotheses assumed that the concept of the abundance of information stated in the MRT is true. This assumption has also been made in prior research [20], [21].

3. MATERIALS AND METHODS

3.1 Data Collection and Experimental Procedure

The study sample comprised 80 adults who had previously used news notification apps. To avoid the effect of individual learning on experimental outcomes, the experiment was designed for between-group rather than within-group testing. Since face-to-face interactions were hindered by the COVID-19 pandemic, online data collection was conducted by a research laboratory in a university located in Incheon, South Korea through non-face-to-face interactions via Zoom software. We employed a random sampling method among the registered users of a news application app and conducted a satisfaction survey for each participant about their experience with the app.

The study aim was introduced to the participants in written form as follows: "We aim to test the utility of a news service app." We did not disclose details regarding the variables of interest and the hypotheses owing to concerns that their knowledge of these minutiae could interfere with experiment effectiveness. A suitable time for participation was set up with each participant. Data collection for each participant took approximately an hour. Participants engaged in the experiment as they found it feasible because a comfortable time for participation was ensured. The experiment started when participants told the experimenter that they were ready.

The first stage of the experiment entailed preparing the participants to use the news app. At the onset of the experiment, the experimenter briefly introduced themself and explained the aims of the experiment before the participant received the consent form. Participants were given sufficient time to read the consent form and sign it. As the experiment was conducted online, consent from the participants was also obtained online. The consent form and the experimental procedure were approved by the Institutional Review Board. The experimenter then transmitted an application installation file to the participant's smartphone, guiding the participant through the installation process. After installation, the app was turned on, and the participants registered their email addresses. The experimenter ensured that their email addresses were properly registered on the server. In case of unsuccessful email registration, the experimenter acknowledged a problem with the application, inciting the provision of guidance for the participant to delete the application, reboot the smartphone, and reinstall it. Upon successful registration, the experimenter accessed the server and sent out a test notification to verify proper functioning.

After receiving the confirmations, six news article notifications (one from each theme on the Naver News website ranking tab) were sent out according to each condition at five-minute intervals. The valence of emoticons in the notifications was defined according to the types of consumers' reactions via the following buttons: Like, Dislike, Touching, Sad, and Curious. The consumers' reactions were exposed in two posits of the news article webpage, one at the top and the other at the bottom. Regarding summary information, we used the first sentence in the summary information provided by the "summary bot" in the Naver news article. After sending out the

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notifications at five-minute intervals, or after approximately 30 minutes, the experimenter sent out a notification to participants containing a post-test web survey and guided them on how to complete it. The web survey contained the necessary items for the study, such as sex, age, and satisfaction score.

3.2 Independent Variables and Experimental Conditions

Independent and dependent variables were determined based on the hypotheses before the experiment design. The independent variables were as follows: (1) the valence (i.e., positive/negative) of the emotions aroused by emoticons (i.e., additional visual information) and (2) the inclusion of summary information in news notifications (i.e., additional text information). Before the experiment, only participants who had already used an existing news notification app were recruited to avoid problems related to lack of literacy/knowledge regarding app usage and to be able to compare satisfaction scores between existing news apps and experimental ones.

To manipulate these variables, we designed four different conditions using two-factor designs (Table 1), and 20 participants were randomly assigned to each of the four conditions. In Condition 1, there was no additional information, and participants received the standard news notifications (i.e., only the article title) on their smartphones at regular intervals (i.e., every 5 minutes). Condition 2 was similar to Condition 1, but with an additional emoticon of relevant valence. Condition 3 was similar to Condition 1, but with additional summary information. Condition 4 was similar to Condition 1 but with the addition of both an emoticon of relevant valence and article summary information.

3.3 Dependent Variables

The CTR (described through percentages) describing the degree of reaction to smartphone notifications was measured by the number of clicks on news notifications by users per number of news notifications. We expected that notifications with summary information and an emoticon would have higher CTR than those without.

Satisfaction was measured through a survey based on that of Wixom and Todd [31], using a 7-point Likert scale; we provided participants with similar questions to validate each one's satisfaction level. The 10 items are as follows: "the notification of existing mobile news apps is satisfactory from all perspectives," "the notification experience of existing mobile news apps is overall satisfactory," "the notification experience of existing mobile news apps is pleasant," "the notification experience of existing mobile news apps is great," "I find the use of notifications in existing mobile news apps favorable," "the notification of experimental mobile news apps was satisfactory from all perspectives," "the notification experience of experimental mobile news apps was overall satisfactory," "the notification experience of experimental mobile news apps was pleasant," "the notification experience of experimental mobile news apps was great," and "I find the use of notifications in experimental mobile news apps favorable."

The survey questions contained two sub-factors: satisfaction with existing mobile news apps (i.e., first 5 items) and satisfaction with the experimental mobile news app (i.e., latter 5 items); higher scores in the survey indicated higher satisfaction. For data coding, we calculated participants' satisfaction by summing up the differences between the sub-factors.

Be aware of the different meanings of the homophones "affect" (usually a verb) and "effect" (usually a noun), "complement" and "compliment," "discreet" and "discrete," "principal" (e.g., "principal investigator") and "principle."

3.4 Development of the App and Actualization of the Notification Service

We developed a Firebase Cloud Messaging news notification app (Figure 1) using Android Studio. After development, the news notification function was implemented in conjunction with the Firebase database (DB). Android Studio provides a mobile app testing environment, which allowed us to create an Android Application Package (APK) file of the app for the experiment. We distributed this APK file to participants. The new app tracks users' clicks on the news (Figure 1, bottom portion) by automatically recording the number of clicks on the Firebase DB.

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A PHP board was developed to conveniently prepare and send news notifications (Figure 1, left side). It comprised three types of information: title, emoticon, and summary, and contained a link. It was designed to allow the administrator to manually select and send relevant news notifications, as well as include different types of information in the notification. After the development of the PHP board, we used the Android emulator and smartphones to verify app actualization and the receipt of notifications (Figure 1, right side). Specifically, the notification was sent using the Android notification function; when clicked, the linked news URL was activated and guided the user to the news page. It was designed to allow users to check all sent notifications when directly running the notification app

3.4.1 News Notification Source: Naver News

Naver is a comprehensive website in South Korea that provides various services (e.g., search, news, and shopping; Figure 2). It is the top aggregator of information from many media companies and has the highest news usage rate in South Korea at above 75%. It is not an exaggeration to say that most South Koreans use Naver to acquire information [32]. For our experiment, we utilized news information provided by Naver News, from which users can read news from all media outlets in real-time. Of its many services/functions, we utilized only the real-time news feed as our notification source for ranking news. To minimize the impact of our study participants' personal interests on CTR, we controlled the categories of interest by sending notifications regarding each of the six news sections in Naver (i.e., politics, economy, society, living, world, and information technology [IT]; Figure 2).

After sending notifications during the experimental conditions, we provided summary information together with the news title. Experimenter-generated summaries were not used for the new app's notifications owing to concerns regarding objectivity. Hence, we chose to use the unmodified Naver summaries for the articles (Figure 2, bottom), which contained three sentences, on average and were unambiguous. Generally, the three-sentence summary provided by Naver is generated via the neuro-linguistic programming (NLP) learning model to extract the core message of the article [33].

3.5 Data Analysis

The order of data analysis procedures was as follows:

- A nonparametric analysis of variance (ANOVA) to determine significant differences by experimental condition;

- T-test for assessing click-through rate mean (M) differences between the groups with and without emoticon of any valence;

- T-test for assessing mean satisfaction score differences between the groups with and without emoticon of any valence;

- T-test for assessing mean click-through rate differences between the groups with and without summary information;

- T-test for assessing mean satisfaction score differences between the groups with and without summary information;

- Multiple regression analysis to understand the effect of each experimental condition on dependent variables;

All statistical analyses were performed using R software (version 3.5.3, The R Foundation for Statistical Computing).

Additionally, to prevent the impact of pop-up notifications (e.g., as a preview or on the locked screen of smartphones), we set a default notification setting. We also assumed that there would be individual differences regarding interest in the six themes. Hence, we used the article ranked number 1 in each of the six sections of Naver News at the time of sending the notification to each participant. Furthermore, we ensured that three of the

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notifications had positive emoticons and the other three had negative emoticons to control for preferences regarding emoticon valence (i.e., Conditions 2 and 4). We did not conduct a separate manipulation test to avoid influencing the experimental results. Finally, we collected participants' demographic information through the post-test survey, including age, region of residence, sex, occupation, and news service usage habits (see Appendix A)

4. RESULTS

4.1 Participants' Characteristics (See Appendix B)

For a better understanding of the participants in this study, we conducted a post-test web survey to gather their basic information, such as sex, age, and satisfaction score, and supplementary items such as media usage for news sources, news channel sources, weekly usage, daily usage, and notification habits.

According to the composition of the survey respondents in terms of educational background in Table B.1, the majority held a bachelor's degree (67.50%), followed by a master's degree (15.00%). The rest were Ph.Ds. (10.00%) and high school graduates (7.50%). In terms of occupation as shown in Table B.1, most of the survey respondents were regular workers (55.00%). The remaining occupations showed similar compositional distribution.

Table B.2 shows the types of media channels participants source their news from. Online news obtained from mobile phones had the highest frequency (80/80), followed by computers (51/80), and television (43/80). Table B.3 shows the frequency and percentage of participants' use of different types of mobile news channels. Most of the respondents checked portals for the news; 78.75% were Naver Portal users. Other portals, Daum and Google, showed about 7% frequency of use, while other channels showed about 4% frequency of use.

When asked how many days they used the mobile news app over the past week, the majority of the participants answered daily. The percentage of participants who answered 6 days and 2 days in a week came in second and third, respectively, as shown in Table B.4. Table B.5 shows the number of times participants use mobile news apps in a day. The majority of the participants answered more than five times (63.75%). The percentage of participants who used the news app less than 5 times in a day showed similar results at 5–10%.

Table B.6 shows how many times participants check mobile news notifications per day. It was found that the majority of users did not check even if the news notification went off. The majority of the participants (52.50%) said they did not check mobile news notifications in the past day, but 12.50% and 11.25% said they checked more than five times and one time, respectively.

4.2 Comparison Analysis

Among the participants, 52 (65%) were male and 28 (35%) were female. Most (37.5%) of them were in their 30s, while the other age groups accounted for 15% each of the sample. The average click-through rate was 58.33%, with a standard deviation (SD) of 32.02. The average satisfaction score was 6.23, with an SD of 3.49 (Table 2). The difference in satisfaction scores was calculated by subtracting the scores of the two types of apps as follows: Function 1 ($\sum$(Satisfaction Score of Proposes App- Satisfaction Score of Pre-existing App)

The average click-through rate increased in the following order: Condition 1 (M = 28.33, SD = 20.30), Condition 2 (M = 48.33, SD = 28.05), Condition 3 (M = 66.66, SD = 25.36), and Condition 4 (M = 90.00, SD = 13.68). The average satisfaction score showed a similar pattern: Condition 1 (M = 2.5, SD = 1.24), Condition 2 (M = 8.7, SD = 1.72), Condition 3 (M = 5.5, SD = 4.21), and Condition 4 (M = 8.2, SD = 1.51); in Condition 3, the average was 5.5, slightly lower than that of Conditions 2 and 4 (Table 3).

Regarding the control for click preference by emoticon valence, after verifying the actual number of clicks by participants in each condition through the chart, we confirmed that we were able to control this potential confounder appropriately.

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Regarding ANOVA, the F-statistic values were 27.23° and 26.59° for click-through rate and satisfaction score, respectively, with statistically significant P-values (0.001 and 0.001, respectively). Thus, there is a clear association between the two dependent variables and conditions, which leads us to conclude that consumers' CTR and satisfaction improved when the emoticon and summary information was added (Table 4).

Regarding the t-tests, the average click-through rate was significantly higher ($p < 0.01$) among participants who visualized emoticons (M = 69.17, SD = 29.94) than their counterparts who did not (M = 47.50, SD = 29.48). Furthermore, the average satisfaction score was significantly higher (p = 0.001) among participants who visualized emoticons (M = 8.5, SD = 1.60) compared to their counterparts (M = 4.0, SD = 3.8). Hence, adding emoticons to news notifications significantly increased consumer satisfaction, supporting H1 (Table 5).

Further, from the t-tests, the average click-through rate was significantly higher (p = 0.001) among participants who visualized the summary (M = 78.33, SD = 23.03) compared to their counterparts (M = 38.33, SD = 25.87). The average satisfaction score was also significantly higher ($p < 0.05$) among participants who visualized the summary (M = 6.9, SD = 3.37) than their counterparts (M = 5.6, SD = 2.34). Hence, adding summary information significantly increased consumer satisfaction, supporting H2 (Table 6).

4.3 Regression Analysis

To compare Condition 1 with the other conditions and define how each condition, age group, and sex affected CTR and satisfaction scores, we conducted a dummy multiple linear regression analysis (Table 7). As proven in the ANOVA test (click-through rate: F = 27.23, satisfaction score: F = 26.59), the regression model showed suitability for using the click-through rate and satisfaction score as dependent variables. We observed that all conditions influenced users' click-through rate and satisfaction with a significantly low p-value. For the click-through rate, Condition 4 (i.e., additional summary and emoticons) showed the highest influence (B = 61.68, SE = 6.94). For satisfaction, Condition 2 (i.e., additional emoticon) showed the highest influence (B = 6.22, SE = 0.79). From the fitness test of the model through F-statistics, we concluded that both models were suitable. Based on the regression analysis, we inferred that both the summary information and the emoticon had a statistically significant effect on both dependent variables when compared with the reference group, Condition 1.

5. DISCUSSION

Our study verified the problems with existing news notifications by developing a news app with improved notification features. Our key conclusion was that consumer satisfaction could be improved by adding emoticons and summary information in news notifications. We ensured accuracy in our consumer satisfaction measurements by introducing two requirements: all experimental participants had to have had experience with existing news apps, and we needed to be able to verify the notification click-through rate in the newly developed app. Our results showed that the average satisfaction score for the new experimental app was greater than that of the existing news app. Specifically, the addition of emoticons and summary information led to statistically significant higher mean CTR and satisfaction scores, which signified an increase in consumer satisfaction.

The following selected comments from participants strengthen our argument and reinforce the study results:

- "I do not often use news notifications, but I checked the news more during the experiment because the articles seemed more interesting with the visual emoticons." (Participant #11)

- "I normally use news notifications a lot, but I am sure that I will be using them more often when provided with information other than just news titles or headlines." (Participant #28)

- "When the notification does not only contain the title, I become more interested and to click on it more than usual." (Participant #73)

- "News notifications come with a summary, so I can get a better sense of what the article would be like. The content of the article cannot always be known from the title alone. I am more interested in clicking on the article when the notification includes a text summary." (Participant #43)

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- "It would be better if the news app provided a function to filter the information we were presented with when using the notification service. Current news notification services often only show titles, or it does not allow users to filter the information they want to see." (Participant #59)

Most prior research has examined the effectiveness of the use of emoticons in chatting among users on social media [23-26]. The findings of this study support that emoticons and summary information can improve consumer satisfaction by increasing information abundance. Our study has thus revealed that the scope of the use of emoticons surpasses social media by demonstrating the use of emoticons and summary information for the transmission of commercial/public news, specifically through mobile app notifications. Daniel and Camp [25] confirmed through news notifications that adding relevant emoticons facilitates message understanding and increases message credibility for users, which is supported by the evidence in our study. Accordingly, H1, H2, H3, and H4 were confirmed and supported; additional visual and text information in the news app notification increased consumer satisfaction.

Our study provides the following theoretical contributions. First, the findings of our research supported the MRT which posits that an abundance of information will increase consumer satisfaction by balancing information asymmetry between suppliers and consumers. Although we have not assessed information asymmetry directly, our results still show enhanced consumer satisfaction by increasing the abundance of information in notifications. Nonetheless, we cannot ignore the potential problems that consumers might encounter with accessing news information online (e.g., through news app usage). Information fatigue [34], [35], which is generally caused by information overload [36], is a common problem that has been attributed to news organizations' aggressive marketing performance (e.g., forward referencing [37]). Hence, future research on notification apps for news delivery should look into information fatigue and overload.

Our findings showed that the issue is not information abundance, but rather the method of delivery. After including emoticons and summary information (i.e., additional information, ensuring information abundance) in the news notification apps, we eventually saw an increase in consumer satisfaction. Hence, our study supports the MRT, as the abundance of information coupled with a relevant delivery method (i.e., additional visual and textual information, namely, the provision of a creative news notification method) led to increased consumer satisfaction. In summary, in scenarios where consumers are supposed to access news information goods "at first glance" (e.g., in-app notifications), news apps should provide consumers with relevant, creative, and more detailed delivery methods for news information.

Our study provides the following practical contributions. The technology we used in the experiment to develop the news notification app was not high-end. Conversely, the development entailed a simple procedure to enhance the visualization and balance of the information presented in notifications. Hence, creative yet simple efforts by notification services may help increase consumer satisfaction. Specifically, our study results serve to inform professionals in the news industry regarding the need to pay attention to consumers' responses to news information delivery.

As mentioned previously, consumers may exhibit unexpected and generally negative responses (e.g., news information fatigue) if industrial stakeholders maintain their conventional method of news notifications in mobile applications, such as showing only the headlines with limited information. Moreover, such maintenance may lead to a mismatch between consumer satisfaction and stakeholders' expectations. Our results show that the news notification delivery system is just as important as the news information provided in the context of consumer satisfaction. Nonetheless, it seems that the IT industry (e.g., news websites) has been focusing on the technology itself, without paying much attention to consumers' needs. However, our evidence demonstrates the importance of paying attention to consumers' perspectives and needs. Based on our findings, utilizing the appropriate methods of delivering news information may increase consumers' satisfaction even if the new technology is not high-end. Therefore, efforts by the industry to enhance the quality of delivery methods of news information for consumers may prove significant and useful for enhancing user satisfaction.

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6. CONCLUSION

This study attempted to fill the theoretical gaps in prior studies that only analyzed the use of emoticons in social media for consumer satisfaction. Based on our empirical results, we concluded that stakeholders could improve consumer satisfaction by sending news notification messages that include additional information, such as emoticons and summaries of the news articles when developing news notification apps. Our study makes a unique contribution to the literature by using a combination of objective and subjective variables to validate consumer satisfaction. We considered the participants' comments regarding their experience using the experimental application. Moreover, to gain a better understanding of their experience, we also surveyed the participants on their background information and news app usage and habits.

Our study presents some limitations that warrant emphasis. First, our study comprised a small sample size, denoting that our findings may lack significance, especially for generalizations. Thus, future studies should endeavor to augment the sample size and repeat the experimental conditions we proposed. This will ensure more generalizable and robust evidence regarding consumer satisfaction in the context of news notification apps. Second, we did not add additional independent variables to lower study complexity. We observe opportunities for enhancing the significance of the results if future research could add variables, such as the preference of information acquisition by age group and news category of interest by participant, to their study design.

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TABLES AND FIGURES

List of Tables:

Table 1 - Experimental condition matrix

		IV1: News summary information	
		No summary information	Summary information included
IV2: Visual Information	Emoticon not included	**Condition 1** Article title	**Condition 3** Article title + summary
	Emoticon included	**Condition 2** Article title + emoticon	**Condition 4** Article title + emoticon + summary

Note: IV = independent variable.

Table 2: Descriptive statistics with raw data collected from both the Firebase database and the post-experiment survey

Categorical variables	**Frequency**	**Percentage**
Sex		

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Male	52	65.0%	
Female	28	35.0%	
Age			
20–29	10	12.5%	
30–39	30	37.5%	
40–49	12	15.0%	
50–59	14	17.5%	
60–69	14	17.5%	
Continuous variables	Min.	Max.	M	SD
Click-through rate	0.00	100.00	58.33	32.02
Satisfaction score	0.00	11.00	6.23	3.49

Table 3: Mean and standard deviations for dependent variables by condition

	Condition 1 (n = 20) M (SD)	Condition 2 (n = 20) M (SD)	Condition 3 (n = 20) M (SD)	Condition 4 (n = 20) M (SD)
DV1: Click-through rate	28.33 (20.30)	48.33 (28.05)	66.66 (25.36)	90.00 (13.68)
DV2: Satisfaction score	2.5 (1.24)	8.7 (1.72)	5.5 (4.21)	8.2 (1.51)

Note: DV = dependent variable.

Table 4: Analysis of variance results for the dependent variables

ANOVA Results	F	p
DV1: Click-through rate	27.23	0.001***
DV2: Satisfaction score	26.59	0.001***

Note: ANOVA = analysis of variance; * p < 0.05, ** p < 0.01, *** p < 0.001

Table 5: T-test results for the dependent variables by condition with additional visual information

	Emoticon Included (n = 40) M (SD)	Emoticon not Included (n = 40) M (SD)	t	p
DV1: Click-through rate	69.17 (29.94)	47.50 (29.48)	3.26	0.002**
DV2: Satisfaction score	8.5 (1.60)	4.0 (3.8)	7.61	0.001***

Note: Emoticon included = Conditions 2 and 4; Emoticon not included = Conditions 1 and 3; * p < 0.05, ** < p 0.01, *** p < 0.001

Table 6: T-test results for the dependent variables by condition with additional text information

T-test Results	Summary Included (n = 40) M (SD)	Summary not Included (n = 40) M (SD)	t	p
DV1: Click-through rate	78.33 (23.03)	38.33 (25.87)	7.30	0.001***
DV2: Satisfaction score	6.9 (3.37)	5.6 (2.34)	2.00	0.049*

Note: Summary included = Conditions 1 and 2; Summary not included = Conditions 3 and 4; * p < 0.05, ** p < 0.01, *** p < 0.001

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Table 7: Results of the regression analysis by sex, age, and condition

Variables	Click-through rate B (SE)	Satisfaction score B (SE)
Conditions		
Condition 2	21.29 (6.96)**	6.22 (0.79)***
Condition 3	39.50 (6.99)***	2.92 (0.79)**
Condition 4	61.68 (6.94)***	5.70 (0.79)***
Age	0.03 (0.19)	0.02 (0.02)
Sex (= Female)	12.92 (5.25)*	0.21 (0.60)
R-squared	0.56	0.52
F-statistic	18.46***	16.01***

Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Unstandardized regression coefficients are shown; standard errors are in parentheses. Condition 1 was used as the reference group.
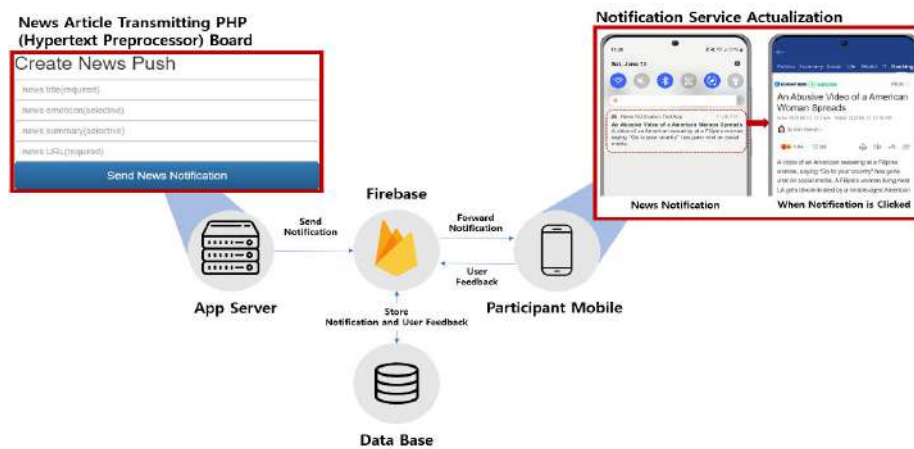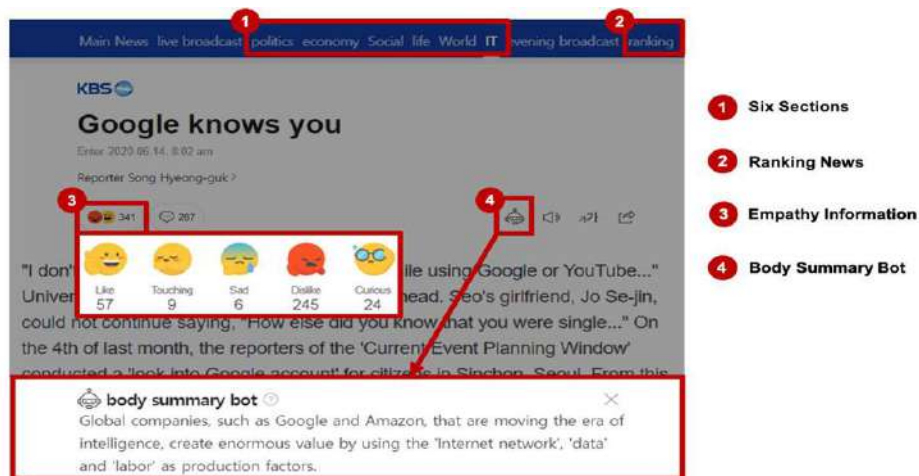
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Figure 1: *Schematic diagram of the news notification application development*

cf. The six articles that were used in the experiment conditions were equal, and they were determined by the number of likes and dislikes. Specifically, those with many likes were used as positive news sources, whereas those with many dislikes were used as negative news sources.

Figure 2: *Example of a page in Naver News*

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Appendix A

1. Questions for the Post-Experiment Web Survey

1. (Understanding users) What is your educational background?

2. (Understanding Users) What is your sex?

3. (Understanding Users) What is your age?

4. (Understanding Users) What is your occupation?

5. (Understanding users) On what type of media channel do you typically read the news?

6. (Understanding Users) What channels do you mainly check mobile news through?

7. (Understanding users) How many days in the past week did you use the mobile news app (including portals and media companies)?

8. (Understanding users) How many times have you used the mobile news app (including portals and media companies) in the past day?

9. (Understanding users) How many times have you checked the mobile app news notifications (including portals and media companies) in the past day?

10. (Understanding users) Which among the various types of settings for notifications in the mobile news app do you prefer?

11. (Satisfaction) The notification of existing mobile news apps is satisfactory from all perspectives

12. (Satisfaction) The notification experience of existing mobile news apps is overall satisfactory.

13. (Satisfaction) The notification experience of existing mobile news apps is pleasant

14. (Satisfaction) The notification experience of existing mobile news apps is great.

15. (Satisfaction) (Satisfaction) I find the use of notifications in existing mobile news apps favorable.

16. (Satisfaction) The notification of experimental mobile news apps was satisfactory from all perspectives

17. (Satisfaction) The notification experience of experimental mobile news apps was overall satisfactory

18. (Satisfaction) The notification experience of experimental mobile news apps was pleasant

19. (Satisfaction) The notification experience of experimental mobile news apps was great.

20. (Satisfaction) I find the use of notifications in the experimental mobile news app favorable.

21. You have finished answering all the questions. If you have further comments about the experiment, please feel free to let us know. We value your feedback for our research. Thank you.

Appendix B

Table B.1: Participants' educational and professional background

Educational Level	Frequency	Percentage
High school graduate or equivalent	6	7.50%
Bachelor's degree or equivalent	54	67.50%
Master's degree or equivalent	12	15.00%
Doctoral degree or equivalent (including medical degree)	8	10.00%
Occupation	**Frequency**	**Percentage**

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Regular office workers	44	55.00%
Entrepreneurs	7	8.75%
Civil servant/public corporation/ teacher/professor	6	7.50%
Research position	5	6.25%
Professional (e.g., medical, corporate, engineering)	4	5.00%
Freelancer	3	3.75%
Student	2	2.50%
Others	9	11.25%

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