

Can Coupon Holding Duration and Message Framing Increase the Effect of Push Notifications on Mobile Coupon Redemption? Evidence from A Randomized Field Experiment

Soonki Hwang^a, Jai-Yeol Son^{b,*}, Sunju Park^c, Kil-Soo Suh^d

^a *Mobile Commerce Business Team Leader, Onestore Corporation, Korea*

^b *Professor, Information Systems, Yonsei University, Korea*

^c *Professor, Operations, Decisions and Information, School of Business, Yonsei University, Korea*

^d *Professor, Information Systems, Yonsei University, Korea*

ABSTRACT

We propose a mobile coupon strategy designed to increase the effect of push notifications on redemption. The proposed strategy recommends that firms deliver mobile coupons with distant expiration dates and remind them through push notifications framed negatively once these expiration dates become imminent, rather than frequently sending coupons with near expiration dates. We test the effectiveness of the proposed strategy using data collected through a randomized field experiment. The findings indicate that push notifications enhance coupon redemption rates for coupons that are held longer by customers than those that are recently received. Additionally, we found that sending negatively framed push notification messages to remind customers of imminent coupon expiration dates further resulted in higher coupon redemption rates. The findings can be employed to offer useful guidance on how to effectively design mobile coupons for achieving higher redemption rates.

Keywords: Randomized Field Experiment, Mobile Coupon, Mobile Promotion, Coupon Expiration, Message Framing

1. Introduction

Given that the amount of time that consumers spend using mobile devices continues to increase, firms are constantly seeking better ways of engaging

with customers through the cost-efficient mobile channel. Not surprisingly, there has been remarkable growth in mobile-based promotions in recent years, and by 2022 the amount spent on mobile advertising in the U.S. is expected to surpass the combined adver-

*Corresponding Author. E-mail: json@yonsei.ac.kr

tising amount spent on all traditional media, including TV, radio, and print (Statista, 2019). Accordingly, the effective exploitation of the mobile channel for marketing communications has become an important topic for both researchers and practitioners. However, mobile-based promotion strategies are still in their infancy and have not yet achieved their potential (Ghose et al., 2019b). As the understanding of how to exploit mobile technologies advances, the mobile platform will undoubtedly become an even more important context for marketing strategies.

Given the prominent role of mobile technologies as a new marketing channel, much research has recently been undertaken to develop a better understanding of how to exploit mobile technologies for new marketing strategies. Studies have suggested that mobile-based promotions should carefully attend to the context in which they are presented because it has been empirically demonstrated that both spatial and temporal aspects of mobile coupons contribute to increased customer purchasing (Danaher et al., 2015; Fang et al., 2015; Ghose et al., 2019a; Ghose et al., 2019b; Luo et al., 2014). Prior work has also indicated that it is more effective to issue mobile coupons with shorter time periods until expiration because the increased time pressure intensifies the urgency to redeem the coupons (Danaher et al., 2015; Ghose et al., 2019a). Recently, several studies have shown that push notifications, which can be delivered to customers at low cost, represent a quick and easy marketing communication mechanism that can effectively induce desirable responses such as coupon or reward redemption and customer purchases (Bies et al., 2021; Lee and Gopal, 2016). <Table 1> summarizes the major empirical studies on mobile coupons and advertising.

We contribute to the emerging body of knowledge in this important area by examining two important issues that remain unexplored in the literature. First,

in contrast to past research that has examined the effect of the length of time until coupon expiration on redemption (Danaher et al., 2015), our study investigates whether how long a coupon is held by a customer affects the effectiveness of push notifications designed for redemption. Research has shown that consumers holding a coupon feel more redemption pressure as the expiration date approaches (Inman and McAlister, 1994). In the context of mobile coupons, empirical evidence has demonstrated the impact of length of time until expiration on redemption (Danaher et al., 2015). However, no scholarly effort has yet been devoted to examining the impact of how long a customer holds a mobile coupon on redemption. We propose that pressure on consumers to redeem a coupon with an imminent expiration date will be higher if the coupon has been held for a longer period of time because consumers will perceive a greater sense of urgency. If this claim can be empirically validated, this would indicate that firms can amplify redemption pressure by delivering mobile coupons with distant expiration dates and then reminding customers of the imminent expiration dates via mobile communication channels.

Second, extending prior work that has demonstrated the positive impact of push notifications on mobile coupon or reward redemption (Bies et al., 2021; Lee and Gopal, 2016), we propose and test whether the framing of messages in push notifications can further increase consumer redemption of mobile coupons. While consumers are motivated to avoid the loss represented by an unredeemed coupon, it is also possible that they will forget they have the coupon at all. Firms can easily and inexpensively leverage mobile technologies by using push notifications to remind customers that a coupon is nearing its expiration date and can also trigger a sense of urgency by carefully framing the message.

<Table 1> Comparison of Relevant Studies on Mobile Coupons and Advertising

Study	Independent (Treatment) Variable	Dependent Variable	Data Source and Setting	Key Findings
Andrews et al. (2016)	- Physical crowdedness	- Making a purchase as a response to a mobile offer	Field data from mobile users in subway trains	Physical crowdedness enhances mobile users' responses to mobile ads.
Bies et al. (2021)	- Push notification	- Reward redemption - Consumer spending	Field experiment with participating customers of a store-loyalty program in a grocery store	Push notifications have a positive effect on consumer spending. They have a stronger effect on reward redemption.
Danaher et al. (2015)	- Distance - Face value - Product type - Day of week - Time of day - Coupon order - Expiry length - Coupon redemption history	- Coupon redemption	Field experiment with visitors of a shopping mall	Distance, face value, product type, day of week, time of day, coupon order, and coupon redemption history have significant effects on redemption. When the expiration date is more distant, the coupon is less likely to be redeemed.
Fang et al. (2015)	- SMS messages with geographical targeting	- Contemporaneous (same-day) purchases - Delayed (subsequent-day) purchases	Field experiment with mobile users who are potential customers of a movie theater chain	Location-based mobile promotions significantly increase both contemporaneous (same-day) purchases and delayed (subsequent-day) purchases.
Ghose et al. (2019a)	- Commuters vs. noncommuters - Time until coupon expiration	- Coupon redemption	Field experiment with public transit app users	Redemption rates are about three times higher among commuters versus noncommuters. Commuters are more likely to redeem coupons with proximate expiration dates whereas noncommuters are more likely to redeem coupons with distant expiration dates.
Ghose et al. (2019b)	- Trajectory-based mobile targeting	- Coupon redemption	Field experiment with visitors of a shopping mall	By clustering customers into groups based on similarities in trajectory information, firms can more accurately predict individuals' future behaviors, resulting in higher coupon redemption rates and faster redemption behavior among mobile users.
Mills and Zamudio (2018)	- Coupon value - Brand loyalty - Net price range	- Coupon redemption	Observational secondary data obtained from a supermarket	For brand-loyal customers, the positive effect of coupon value on redemption is weaker. When the price of a product is higher other others, the likelihood of redemption decreases.

<Table 1> Comparison of Relevant Studies on Mobile Coupons and Advertising (Cont.)

Study	Independent (Treatment) Variable	Dependent Variable	Data Source and Setting	Key Findings
Lee and Gopal (2016)	- Push notification	- Views and sales of the recommended products	Field experiment with customers of a fashion merchandiser	Push notifications have a large effect on views of recommended products and a large effect on sales.
Luo et al. (2014)	- SMS messages with temporal and geographical targeting	- Sales purchases	Field experiment with mobile users who are potential customers of a movie theater chain	Temporal targeting and geographical targeting increase sales purchases. When they are simultaneously employed to maximize sales purchases, temporal and geographical targeting strategies should be balanced.
Park et al. (2018)	- Price discount coupon - Free sample coupon	- Purchase likelihood and spending	Observational secondary data obtained from a global beauty company	During the coupon redemption periods, both price discount and free sample coupons have positive impacts on customers' purchases and expenditures. Free sample coupons have a longer-term effect, increasing purchases beyond the promotion period.
Present study	- Coupon possession length - Message framing in push notifications	- Coupon redemption	Field experiment with customers of a mobile app company	Despite the same length of time to expiration, coupons held longer by customers are more likely to be redeemed than recently received coupons when they receive push notifications for redemption. Negatively framed push notification messages increase coupon redemption rates.

Specifically, we expect that sending *negatively framed* push notification messages to remind customers of imminent coupon expiration dates will also result in higher coupon redemption rates by highlighting the loss that will ensue if the coupon is not redeemed.

To empirically test the effect on coupon redemption of push notifications (1) for a mobile coupon that is held for a longer period of time, and (2) designed to use message framing to remind customers of imminent expiration dates, we conducted a randomized field experiment in collaboration with a company that sells ringtones and ringback tones through a mobile application. The results suggest

that after receiving a push notification reminder, customers who have held a coupon for a longer period of time will exhibit higher redemption rates than customers who recently received a coupon, given the same discount and the same coupon expiration date. Our results also indicate that negatively framed push notifications will have a greater impact on coupon redemption than positively framed push notifications.

To the best of our knowledge, we are the first to theorize and empirically test how the length of time a mobile coupon is held as well as how messages in a push notification are framed influence the like-

likelihood of mobile coupon redemption. Amid the growing popularity of mobile coupons that leverage distinctive features of mobile technologies, the findings of our study can guide managers in the effective design of mobile coupons for achieving higher redemption rates. Specifically, our findings suggest that rather than, for example, delivering a series of mobile coupons with different expiration dates, it is more effective to deliver a single mobile coupon with a distant expiration date and to remind customers of its impending expiration date using negatively framed push notifications.

II. Literature Review

There are a number of studies focusing on how to develop successful mobile marketing strategies that leverage the unique characteristics of mobile technologies. As shown in <Table 1>, most of these studies have employed field experiments to causally demonstrate the impact of unique mobile technology features on the success of targeted marketing strategies. For example, Luo et al. (2014) found that temporal and geographical targeting enabled by mobile technologies can significantly increase the likelihood of using a coupon to watch a movie in a theater. Interestingly, they found an inverted U-shaped relationship between promotion lead time and sales when targeting distant mobile users but identified a negative relationship between these factors when targeting proximal mobile users. Interestingly, Fang et al. (2015) considered the fact that mobile-based promotions, in contrast to traditional paper-based promotions, are stored on mobile devices, making them accessible anytime and anywhere. They found that because of such characteristics, mobile-based promotions have long-lasting impacts on

sales among moviegoers.

Danaher et al. (2015) examined mobile coupon redemption behaviors using the setting of a large shopping mall and found that both location and the time of coupon delivery to mobile phones significantly influenced coupon redemption rates. Additionally, they found that the length of time until coupon expiration, a signal of temporal urgency, is also an important factor influencing mobile coupon redemption. Fong et al. (2015) examined the effectiveness of competitive locational targeting (i.e., geo-conquesting), which involves sending mobile coupons to potential customers near competitors' locations. Specifically, they found that geo-conquesting is particularly effective for increasing sales from customers that a retailer would not otherwise attract.

More recently, Ghose et al. (2019a) found mobile coupon redemption rates to be about three times higher among commuters versus noncommuters. Further, they found that commuters are more likely to redeem mobile coupons with proximate expiration dates whereas noncommuters are more likely to redeem mobile coupons with distant expiration dates. Ghose et al. (2019b) developed a novel "trajectory-based" targeting strategy and offered empirical evidence for the effectiveness of the strategy based on data from a large-scale randomized experiment. Their research indicates that physical movement information such as the latitudinal and longitudinal locations that customers visit, the time and duration of their visits, and the velocity of their movements should be taken into account to maximize the effectiveness of mobile coupon distribution. Specifically, by clustering customers into groups based on similarities in trajectory information, firms can more accurately predict individuals' future behaviors, resulting in higher coupon redemption rates and faster redemption behaviors among mobile users.

Several studies have offered empirical evidence for the role of push notifications in effectively communicating marketing messages with customers who have installed retailers' apps on their smartphones. For instance, Lee and Gopal (2016) found that customers who received push notifications from a fashion merchandiser were more likely to view recommended products and purchase products than those who did not. Similarly, Bies et al. (2021) found that push notifications can be used effectively to increase consumer spending and reward redemption among store loyalty program participants in grocery retailing.

The literature review reveals that the length of time until coupon expiration is an important factor for predicting mobile coupon redemption (Danaher et al., 2015; Ghose et al., 2019a). However, little attention has been devoted to empirically demonstrating the effect of coupon holding time on redemption. In addition, while push notifications have been found to be an effective communication channel for mobile marketing (Bies et al., 2021; Lee and Gopa, 2016), little scholarly effort has been devoted to designing push notification messages to maximize recipient responses. To fill this gap in the literature, we examine the effect of coupon holding time and message framing in push notifications.

III. Hypothesis Development

Given that mobile coupons are highly accessible, our study proposes a mobile coupon strategy that firms can leverage to improve the redemption rate of mobile coupons by stimulating a sense of urgency among coupon holders seeking to avoid the loss in value represented by the mobile coupon. In particular, we recommend that firms issue mobile coupons with distant expiration dates and that they send coupon

holders negatively framed push notifications to remind customers of imminent coupon expiration. We predict that such strategies will be superior to issuing mobile coupons with proximate expiration dates more frequently. We offer theoretical bases underlying these proposed strategies and develop testable research hypotheses to empirically demonstrate the efficacy of such strategies in improving mobile coupon redemption rates.

3.1. Mobile Coupon Holding Period

Individuals often perceive a feeling of regret when comparing the actual outcome of a choice with the potential alternatives that were necessarily discarded (Bell, 1982). According to regret theory, the perceived value of a choice is influenced by the perceived benefits of alternative choices that were not made (Loomes and Sugden, 1982). This line of reasoning extends to the concept of *anticipatory regret*, which has been found to be useful in explaining people's choice behaviors. Simonson (1992) found that when people choosing between Options 1 and 2 were instructed to imagine how they would feel if they found out that their choice of Option 1 was wrong, they were more likely to choose Option 2. Inman and McAlister (1994) suggested that even though their study subjects were not specifically asked to imagine feelings of anticipatory regret, such feelings nevertheless may play an important role in individuals' choices. Specifically, they argued that the notion of anticipatory regret could also be effectively applied to explain coupon redemption behaviors among consumers.

Extending a work by Inman and McAlister (1994), we formulate the perceived magnitude of anticipatory regret from not redeeming a coupon as follows:

Magnitude of impending loss in period

$$t = f(\text{face value}, E - t, t/E)$$

E represents the number of periods until a coupon issued in period 0 expires, and t represents the number of elapsed periods from period 0 to the current period. They assumed that as of period t , consumers estimate the potential loss of the coupon's face value by applying a discount rate. This implies that $f(\cdot)$ exponentially increases as the time remaining until expiration ($= E-t$) proceeds to 0. Since a coupon cannot be redeemed after period E , the maximum value of $f(\cdot)$ for a coupon with a certain face value is reached in period E .

We modified the original equation by adding t/E . We suggest that $f(\cdot)$ exponentially increases as t/E increases. Imagine that a retailer issued Coupons A and B, both of which have the same face value and can be used toward the purchase of certain products from the retailer. Coupon A was delivered 30 days ago and will expire tomorrow (i.e., $E = 30$, $t = 29$); Coupon B was delivered yesterday and will expire tomorrow (i.e., $E = 2$, $t = 1$). Both coupons have the same value ($= 1$) for $E-t$. Thus, $f(\cdot)$ would be the same if the effect of t/E on $f(\cdot)$ were not considered. However, because Coupon A has a larger value ($= 29/30$) of t/E than Coupon B ($= 1/2$), $f(\cdot)$ would be larger for Coupon A if the effect of t/E on $f(\cdot)$ is considered. This is intuitively appealing because a consumer will likely perceive a higher degree of regret from the loss of a coupon's face value upon expiration if the coupon has been held for a longer period of time. Thus, the pressure on a consumer to redeem a coupon in period t will be higher if the coupon has been held for a longer period of time.

The aforementioned theoretical reasoning can assist firms in designing mobile coupons more effec-

tively to achieve higher redemption rates. Specifically, by issuing mobile coupons with distant expiration dates, firms can amplify redemption pressure on customers by leveraging their desire to avoid the sense of loss generated by failing to redeem a coupon prior to its expiration date. Further, mobile technologies provide marketers with tools in the form of *push notifications* to stimulate a sense of urgency among coupon holders as coupon expiration dates approach. When customers receive such push notifications, particularly for coupons that they have held for a long time, we predict that customers will feel an urgency to redeem the coupon in response to the fear of loss associated with not redeeming it. We develop the following testable hypothesis to examine whether our proposed strategy would indeed improve redemption rates for mobile coupons.

H1: The impact of push notifications on redemption rates will be enhanced as mobile coupon holding duration increases.

3.2. Framing Messages in Push Notifications

Message framing refers to the manipulation of a message by highlighting positive or negative outcomes associated with adopting or failing to adopt a particular behavior (Rothman and Salovey, 1997). Positively framed messages emphasize the benefits or positive consequences associated with a certain behavior, whereas negatively framed messages highlight losses or negative consequences. Psychologically, "losses loom larger than gains" (Tversky and Kahneman, 1991, p. 456) and individuals tend to pay greater attention to negative information than positive information in messages. To this end, negatively framed messages are generally understood to be more effective than positively framed messages

in persuading people to engage in recommended behaviors. However, in certain contexts, positively framed messages may be more powerful. For example, studies on health behaviors have shown that negative framing is more effective for detecting disease, but positive framing is more effective for preventing the onset of disease (Broemer, 2004). As such, the domain and type of promoted behavior should be taken into account when choosing between positively and negatively framed messages for purposes of persuasion (Ganzach and Karsahi, 1995).

Prior research has demonstrated that message framing can be used to influence consumer responses to mobile promotions. For instance, Li et al. (2017) demonstrated that prevention framed messages could influence the effectiveness of SMS ad designed by leveraging weather conditions. Specifically, they found that firms should consider using simple neutral frame ad messages on sunny days but using prevention frame ad messages on rainy days. Tiffany et al. (2020) found that a personalized promotion message with gain-framed content sent through push notifications can enhance consumers' perceived value of utilitarian products, which in turn increases purchase intention.

We posit that message framing can also be used to induce redemption among mobile coupon holders. Positively framed messages can stress the benefits of redeeming a coupon (e.g., "save money by redeeming this coupon") while negatively framed messages stress the loss represented by not redeeming a coupon (e.g., "don't give up this opportunity to buy at half price!"). Prior research has offered no direct evidence of the relative effectiveness of positively versus negatively framed messages in promoting coupon redemption behavior. However, research has found that consumer responses to price deals, which are similar to coupon redemption behaviors, are higher

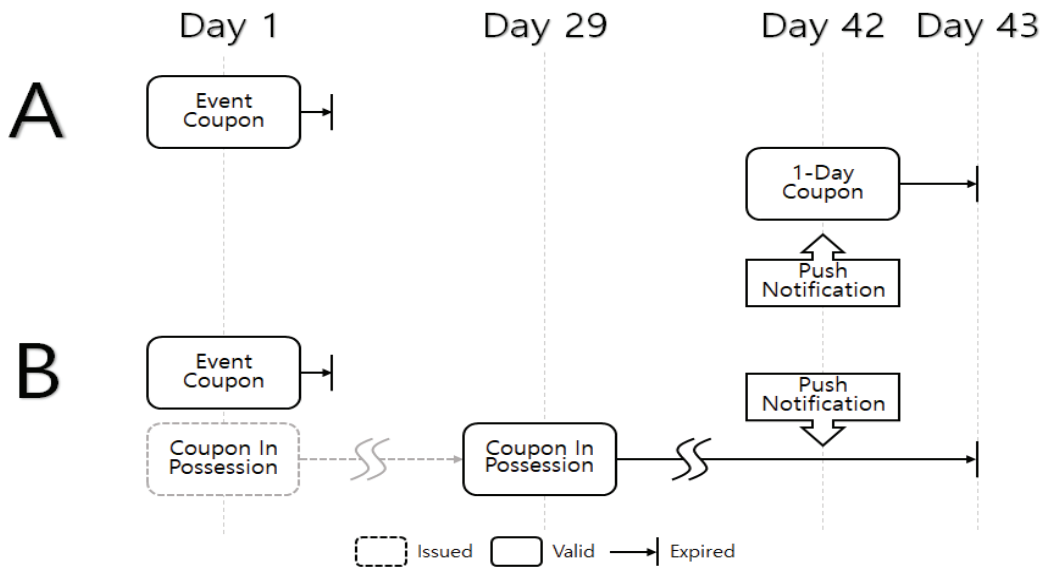
when presented with negatively framed messages (Gamliel and Herstein, 1997). In line with prospect theory (Kahneman and Tversky, 1979), we expect that consumers will be more reluctant to suffer losses than to realize gains of the same size in the context of monetary promotions (Tversky and Kahneman, 1991). We therefore posit that, regardless of coupon holding duration, messages should be negatively framed in push notifications for higher redemption. Accordingly, we hypothesize:

H2: The impact of push notifications on redemption rates will be enhanced when the messages are negatively framed.

IV. Methods: Randomized Field Experiment

We conducted a *randomized* field experiment to test our research hypotheses, which allowed us to robustly examine the causal effect of the treatment on purchases by avoiding numerous potential threats to validity (Burtch et al., 2015). In particular, randomized experiments can effectively circumvent endogeneity issues that may confound results (Fang et al., 2015). Because treatments are randomized, any omitted variables are extremely unlikely to correlate with them. Thus, differences in observed behaviors can be attributed to the treatments rather than to other potential variables such as user heterogeneity. Given these advantages, randomized field experiments are increasingly used by researchers examining user behaviors in online contexts (Burtch et al., 2015).

Our field experiment was conducted in collaboration with a company that sells ringtones and ringback tones through a mobile application. The company is the largest seller of ringtones and ringback



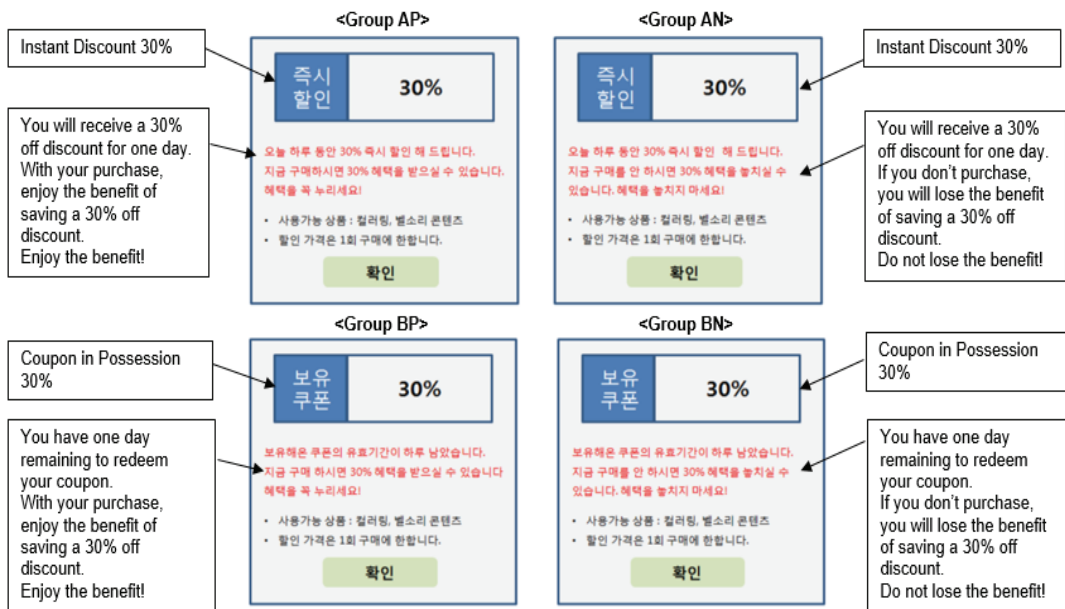
<Figure 1> Steps Taken in the Experiment

tones in Korea and its app has been downloaded about 7 million times. Mobile phone users can purchase the ringtones from the app and install them into their phone so that they can hear their favorite songs or melodies before answering incoming calls. They can also purchase and install ringback tones so that callers can hear while waiting for them to answer the phone. The ringtones and ringback tones sold at the app were priced between 1,100 won (equivalent to 85 cent in USD) and 1,300 won (\$1 in USD). The company agreed to launch a promotion event from October 3 to October 5, 2017. Customers first opening the app during this time period were randomly assigned to two groups: *instant coupon* and *coupon in possession*. They were randomly directed to a promotion event page and informed that they had been selected to receive either (1) a 30% off coupon valid for 24 hours (Group A), or (2) a 30% off coupon valid for 24 hours in addition to a 30% off coupon valid for a two-week period beginning in four weeks (Group B).¹⁾ The 30% off

coupon valid for a two-week period beginning in four weeks given to Group B was the *coupon in possession*, which was used to examine whether holding a coupon for a longer period has an effect on coupon redemption rates. During the promotional event, the 30% off coupon valid for 24 hours (i.e., event coupon) was given to both Groups A and B because the company wanted to offer all customers participating in the promotion an immediate incentive upon being directed to the promotion page. By doing so, we also ensured that customers in both groups received two coupons during the experimental period. As shown in <Figure 1>, customers in Group A received an event coupon and an instant coupon; on the other hand, those in Group B received an event coupon and a coupon in possession.

One day before the expiration date of the longer-term coupon issued to Group B during the pro-

1) The company recommended the four-week interval because after a customer purchases a ringtone or ringback tone, it usually takes at least four weeks before they purchase another one.



<Figure 2> Push Notifications Sent to Customers

motional event, the company sent push notifications to the customers in both Groups A and B. The push notifications offered customers in Group A (who did not possess the longer-term coupon) a 30% off instant coupon valid for 24 hours, and reminded customers in Group B that the coupon they possessed would expire in one day.

The push notification messages (see <Figure 2>) sent to both groups were framed either positively or negatively, resulting in four treatment groups: instant coupon with positive framing (Group AP), instant coupon with negative framing (Group AN), coupon in possession with positive framing (Group BP), and coupon in possession with negative framing (Group BN). This represents a between-subject field experiment because each customer received only one push notification depending on the treatment group they belonged to.

The company had not previously offered any push notification-based promotions. Therefore, all cus-

tomers participating in this experiment had no prior experience receiving promotions through push notifications from this company. Further, no other push notification-based promotions took place during the experimental period. In total, 6,984 customers opened the app between October 3 and October 5, 2017 (i.e., Day 1). We directed all of the customers to the promotion event page developed for this study. A random assignment was used so that each customer opening the app had an equal probability of 50% to be allocated either to group A or group B. As such, the number of customers assigned to Group A was not identical to the number assigned to Group B. Consequently, of the 6,984 customers, 3,476 and 3,508 customers were randomly assigned to Groups A and B, respectively. Based on the number of ringtones and ringback tones purchased prior to the experiment, we tested whether the randomization assignment was successful. The result of a t-test showed that Group A (mean score = 0.83)

was not significantly ($p > 0.1$) different from Group B (mean score = 0.79) in the number of purchases, demonstrating that the random assignment was successful.

Six weeks later (i.e., Day 42), we randomly assigned 3,476 customers in Group A into Group AP ($N = 1,780$) and Group AN ($N = 1,696$). Customers in Groups AP and AN received positively and negatively framed push notifications, respectively, offering a 30% off instant coupon valid for 24 hours. For this random assignment, each customer in Group A had an equal chance of 50% to receive either positively or negatively framed push notifications. The random assignment was successful because the result of a t-test showed that Group AP (mean score = 0.81) was not significantly ($p > 0.1$) different from Group AN (mean score = 0.86) in the number of ringtones and ringback tones purchased prior to the experiment. At the same point in time (Day 42), we randomly assigned 3,508 customers in Group B into Group BP ($N = 1,808$) and Group BN ($N = 1,700$). Customers in Groups BP and BN received positively and negatively framed push notifications, respectively, reminding them that the coupons they possessed would expire in 24 hours. The result of an additional t-test showed that the random assignment was successful because Group BP (mean score = 0.80) was not significantly ($p > 0.1$) different from Group BN (mean score = 0.77).

V. Econometric Analysis

Our study is primarily interested in testing the effect of *each* of proposed mobile coupon strategies (*instant coupon* vs. *coupon in possession* and *positively* vs. *negatively framed messages*) on redemption incidence. We used a logit model because the outcome variable of main interest is a binary indicator of

whether a customer redeemed a coupon to purchase ringtones and ringback tones. The logit model was developed to mainly test the effects of the treatments (i.e., mobile coupon strategies) on redemption. Specifically, we set up our model to estimate the unobserved likelihood or probability of coupon redemption for each customer i , denoted as *coupon redemption* $_i$. Specifically, our model estimates the latent probability of coupon redemption as a logit function of coupon type (*coupon type* $_i$) and message framing (*message framing* $_i$). In the model, the error terms (ε_i) for customer choices are assumed to have an independent and identically distributed extreme value distribution (Agarwal et al., 2011; Luo et al., 2014):

$$\text{Coupon Redemption Probability}_i = \frac{\text{Exp}(U_i)}{\text{Exp}(U_i) + 1}$$
$$U_i = \alpha + \beta_1 \text{coupon type}_i + \beta_2 \text{message framing}_i + \beta_3 \text{previous}_i + \beta_4 \text{during}_i + \varepsilon_i,$$

where U_i denotes the latent utility of redeeming a mobile coupon. We added *previous* $_i$ and *during* $_i$ to control the effect of unobserved customer heterogeneity (i.e., customer's propensity to purchase ringtones or ringback tones). *previous* $_i$ is the number of purchases made for nine weeks prior to the promotion event, and *during* $_i$ is the number of purchases made during the promotional event (Day 1). Our primary interest lies in the main effects of coupon type and message framing on coupon redemption. <Table 2> reports the descriptions of the variables in the analysis and their descriptive statistics.

VI. Results

This section presents the analysis results based

<Table 2> Variable Descriptions and Descriptive Statistics

Variable	Description	Mean	Median	Std. dev.	Min	Max
Previous	The number of purchases during the nine weeks prior to the promotion event	0.812	0	1.788	0	55
During	The number of purchases during the promotion event period (Days 1 - 3)	0.774	0	1.205	0	18
Coupon Type	Coupon is classified as an instant coupon (coded to 0) if the coupon is valid for 24 hours and was sent via a push notification, or as coupon in possession (coded to 1) if the coupon was issued during the promotion period for a later period and customers were later reminded that the coupon would expire within 24 hours.	0.490	0	0.500	0	1
Message Framing	Push message is framed positively (coded to 0) or negatively (coded to 1).	0.513	1	0.500	0	1
Coupon Redemption	The customer redeems the coupon (coded to 1) or does not (coded to 0) within 24 hours after receiving the push notification.	0.056	0	0.230	0	1

on the data collected from the field experiment. For a preliminary understanding of the coupon redemption behavior of customers participating in the experiment, we first simply compared the proportion of customers in each group who redeemed their coupons. Subsequently, we analyzed the data using a logit model to formally test the research hypotheses developed in the study.

6.1. Preliminary Findings

As summarized in <Table 3>, after receiving the push notification delivering an instant coupon or a reminder of the imminent expiration of their coupon in possession, 383 customers redeemed coupons to purchase a ringtone or ringback tone within 24 hours. Overall, this represents a conversion rate of 5.62% (= 383/6,816).²⁾ Of the 3,476 customers as-

signed to Group A (i.e., instant coupon group), 145 customers purchased a ringtone or ringback tone within 24 hours after the push notification delivered an *instant coupon*, resulting in a conversion rate of 4.17%. In contrast, of the 3,340 customers assigned to Group B (i.e., coupons in possession group), 238 customers purchased a ringtone or ringback tone in the 24 hours after the push notification delivered a reminder of the imminent expiration date of their *coupon in possession*, resulting in a conversion rate of 7.13%. Therefore, these preliminary findings suggest that customers with a coupon in possession are more likely to purchase a ringtone or ringback tone than those offered new instant coupons with the same expiration date.

Of the 3,498 customers who received positively framed push notifications, 176 customers purchased a ringtone or ringback tone within 24 hours of the

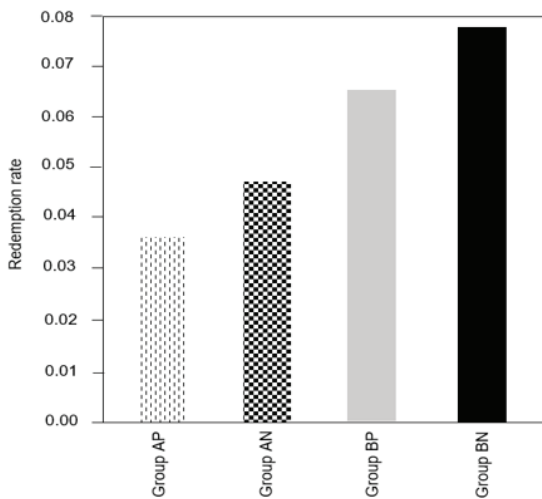
2) Please note that 168 customers with coupons in possession had already redeemed their coupons and purchased ringtones or ringback tones before they received push notifications reminding them of the imminent expiration of the coupons. Our data analysis excludes these 168 customers and thus offers conservative evidence for the effectiveness of coupons in possession (vis-à-vis instant coupons).

<Table 3> Redemptions by Coupon Type and Framing

Coupon Type	Framing		Total	Redemption Rate
	Positive	Negative		
Instant Coupon	1,780 (65)	1,696 (80)	3,476 (145)	4.17%
Coupon In Possession	1,718 (111)	1,622 (127)	3,340 (238)	7.13%
Total	3,498 (176)	3,318 (207)	6,816 (383)	5.62%
Redemption Rate	5.03%	6.24%	5.62%	

Note: The numbers in parentheses represent the number of customers in each cell who redeemed a coupon to purchase a ringtone and ringback tone.

push notification, resulting in a conversion rate of 5.03%. In contrast, of the 3,318 customers who received negatively framed push notifications, 207 customers purchased a ringtone or ringback tone within 24 hours of the push notification, resulting in a conversion rate of 6.24%. These findings suggest that customers are more likely to purchase a ringtone or ringback tone after receiving a negatively framed push notification versus a positively framed push notification. In addition, we found that Group BN (i.e., coupon in possession and negatively framed push notification) had the highest conversion rate of any group at 7.83% (See <Figure 3>).



<Figure 3> Redemption Rates by Customers in Four Group

6.2. Main Findings

The results of the logit model analysis are summarized in <Table 4>. We first tested the impact of two treatments on coupon redemption in the absence of control variables (i.e., Basic Model in <Table 4>). We then included control variables in the model and estimated the model to test the impacts of two treatments on coupon redemption (i.e., Full Model in <Table 4>). We found that regardless of including control variables, coupon type and message framing have significant impacts on coupon redemption within 24 hours of push notifications. Thus, we found that the impacts of the treatments on redemption is robust to control variables.

Findings of the analysis indicated that customers with coupons in possession (Group B) were more likely to redeem their coupons after receiving a push notification than were customers who received instant coupons via push notifications (Group A) ($p < 0.001$). Negatively framed push notifications (Groups AN and BN) had a stronger effect on coupon redemption than positively framed messages (Groups AP and BP) ($p < 0.05$). We also used odds ratios to interpret the economic significance of the results. The odds ratio for the coupon type estimated is 1.788, implying that compared with an instant coupon, a coupon in possession produced a 78.8% increase in

<Table 4> Results from Logit Model Analysis

Variable	Basic Model		Full Model	
	<i>B</i>	<i>p</i> -value	<i>B</i>	<i>p</i> -value
Previous			0.067***	0.004
During			0.126***	0.000
Coupon type	0.568***	0.000	0.581***	0.000
Push message framing	0.230**	0.030	0.233**	0.028
Constant	-3.022***	0.000	-3.440***	0.000
Log-likelihood	-1458.19		-1441.82	
Observations	6816		6816	

Note: ***p* < 0.05; ****p* < 0.01

the odds of redeeming a coupon. The odds ratio for message framing is 1.262, implying that compared with positively framed messages, negatively framed messages produced a 26.2% increase in the odds of redeeming a coupon. As expected, both of the variables that controlled for the effects of customer heterogeneity (i.e., *previous* and *during*) were found to have significant effects on coupon redemption.

VII. Discussion

Given the growing popularity of mobile coupons, examining whether the unique characteristics of mobile coupons could indeed contribute to higher redemption rates for mobile coupons is of timely relevance. The results of our study indicate that an effective strategy for achieving higher redemption rates is offering mobile coupons with relatively distant expiration dates and using push notifications to remind coupon holders of imminent expiration dates. This strategy leverages the unique characteristics of mobile coupons, which are accessible at all times and places on mobile devices and can be easily augmented with push notifications enabling marketers

to remind customers of expiration dates.

7.1. Theoretical Implications

Our study makes several important contributions to the growing body of the literature on mobile coupons. First, unlike prior studies that have examined the effect of the length of time until coupon expiration on redemption (Danaher et al., 2015), our study shows that offering mobile coupons with distant expiration dates has a positive impact on redemption. Despite scholarly interest in the unique features of mobile coupons, the mobile coupon strategy exploiting the length of time that a customer can hold a coupon has not received adequate attention in the literature. This is unfortunate because a key difference between traditional paper and mobile coupons is that users can easily access mobile coupons anytime and anywhere and mobile coupons cannot be lost or damaged. Therefore, mobile coupons are not subject to the “use-it-lose-it effect” associated with the particular vulnerabilities of paper coupons (Aggarwal and Vaidyanathan, 2002). Our study demonstrates that the unique characteristics of mobile coupons can help firms improve coupon redemption rates

by offering mobile coupons with distant expiration dates.

Second, our findings support the effectiveness of message framing in shaping consumer perceptions in the mobile coupon context. We found that negatively framed messages sent via push notifications are more effective for increasing coupon redemption behavior. We speculate that this result is based on the effect identified in previous research suggesting that individuals are more sensitive to loss than to gain and that perceptions of value are elevated when items have been held for a long time. Therefore, we theorize and empirically demonstrate that customers are motivated to redeem coupons that they have held for a relatively long time when reminded of their imminent expiration in order to avoid the perception of loss associated with an unredeemed coupon.

Third, our study is distinct from other studies on mobile coupons in that it deals specifically with coupons used to purchase goods from an online store, whereas most prior studies on mobile coupons have addressed coupons used to purchase goods from physical stores (Danaher et al., 2015; Fang et al., 2015; Ghose et al., 2019a; Ghose et al., 2019b; Luo et al., 2014). The physical presence of stores necessitates targeting strategies based on geo-conquesting that utilize target customers' current (Danaher et al., 2015; Luo et al., 2014) or projected locations (Ghose et al., 2019b). Therefore, the findings from such studies cannot be applied to the context of online stores that lack a physical presence. Our study shows that online stores can exploit features unique to mobile technologies in developing effective mobile coupon strategies. Hence, we confirm the findings in the existing literature by demonstrating the effectiveness of mobile coupon strategies and extend the literature by examining mobile coupon strategies in the underresearched context of online stores.

7.2. Managerial Implications

We provide actionable guidelines for firms seeking to harness the unique features of mobile technologies. First, we recommend that firms offer mobile coupons with distant expiration dates rather than offering multiple instant coupons and that they remind customers of impending coupon expiration dates using push notifications. This strategy fosters a sense of loss associated with the anticipation of a coupon left unredeemed and thereby improves coupon redemption rates *without* increasing the actual discount offered to customers. While our study specifically concerned an online store, we expect that our strategies would also be useful for stores with physical locations. In contrast to paper coupons, offering mobile-based coupons provides easy access to coupons through mobile devices. In contrast to paper coupons with distant expiration dates, which are subject to loss or degradation over time, mobile coupons can be offered with distant expiration dates without such risks. Furthermore, reminder notices for mobile coupons can be quickly and easily delivered via push notifications at little cost to firms.

Second, we recommend that firms carefully frame messages reminding customers of coupon expiration delivered via push notifications. In contrast to positively framed messages highlighting the benefits of coupon redemption, our findings indicate that customers are more responsive to negatively framed messages that emphasize the potential of loss ensuing from failing to redeem a coupon.

Third, considering that customers may suffer from "coupon fatigue" resulting from the proliferation of mobile coupons, we suggest that firms should be prudent in terms of how often they send customers mobile coupons. Because of the low costs associated with sending mobile coupons and push notifications,

mobile marketers can easily be enticed to send mobile coupons and push notifications too frequently. Even though customers may agree to receive mobile-based promotions, sending promotions too frequently may feel intrusive to customers, causing them to develop negative feelings toward the company or to opt out of notifications. Hence, to enhance the effectiveness of mobile coupon strategies, we suggest sending mobile coupons with distant expiration dates less frequently rather than sending coupons with proximate expiration dates more frequently.

VIII. Conclusion

8.1. Limitations and Future Research Suggestions

Like all studies, this study suffers from several limitations, which, however, offer avenues for future research. First, our study was conducted in the context of ringtones and ringback tones that can be purchased online and consumed digitally. As such, the findings of our study can also be easily applied to products such as digital books, movies, and magazines. However, one could question whether the effects on coupon redemption of the coupon holding period and message framing found in our study hold for different types of products whose purchase requires more substantial decision-making. Unlike physical products that require travel to stores or delivery of products prior to consumption, customers can consume digital products directly following coupon redemption. Thus, the effect of the coupon holding period on redemption may not be as strong as that found in our study in the context of physical products because of considerations such as shipping costs and delivery time. Additionally, while consumers are like-

ly to engage in extensive decision-making for expensive products, they may be prone to spontaneous or habitual purchases of inexpensive products such as ringtones and ringback tones, which may have inflated the redemption rate in our study. We therefore encourage future research to evaluate the validity of our results across different product types.

Second, we were unable to control for the effects of some variables that may be associated with coupon redemption behavior. For instance, whereas we were able to control for the number of purchases in the past and during the promotional event (i.e., Days 1 - 3), other customer characteristics such as income level and mobile phone usage were not collected by the company and we were thus unable to analyze them. While our randomized experimental design may have successfully mitigated such issues, future research is needed to evaluate the effects of individual customer characteristics on coupon redemption behavior.

Third, although the data obtained from our randomized field experiment supports the research hypotheses developed in this study, we were unable to offer empirical evidence for the underlying psychological mechanisms used to develop the hypotheses themselves. For instance, we argued that customers in Group B would be more likely redeem a coupon than those in Group A because they would feel a higher degree of urgency. However, our data from the field experiment does not empirically validate this argument. Supplementing our findings with data from a well-designed follow-up interview or survey with the participants of the field experiment as soon as the experiment was complete would have strengthened our study.

Fourth, we note that unlike customers in Group B, those in Group A were not sent a reminder before their coupons expired. Instead, one day before Group B's coupon expired, customers in Group A received

an instant coupon with a carefully framed message that was similar to the message in the reminder sent to Group B customers. While customers in Group A may have been more likely to redeem the coupon had they been sent a reminder after they had received the coupon, to avoid annoying them by sending them both a coupon and a reminder through separate push notifications within 24 hours, we did not send Group A reminders. Nevertheless, sending both groups reminders would have made the conditions more similar in this regard and may have yielded interesting findings.

Finally, to gauge the effectiveness of mobile coupon strategies more effectively, it would be interesting to examine how the implementation of a mobile coupon strategy affects a firm's long-term profitability. Some customers may purchase products even without the presence of mobile coupons. Moreover, customers may be reluctant to purchase products without using a mobile coupon if they expect to receive a coupon in the future. In this regard, our analysis may have overestimated the short-term positive effect and under-

estimated the long-term negative effect of implementing a mobile coupon strategy. Future studies should explore this issue by incorporating the effect of a mobile coupon strategy on long-term firm profitability.

8.2. Concluding Remarks

By virtue of the newness and novelty of mobile technologies, firms continue to seek ways of capitalizing on the unique opportunities enabled by mobile technologies to enhance the effectiveness of coupon strategies. We hope that our study offers assistance to practitioners seeking to design mobile coupons that lead to higher redemption rates. On a theoretical level, this study is among the first to theorize and empirically test the impacts of message framing and the length of mobile coupon possession on the likelihood of coupon redemption. We hope that our study will be useful for future research seeking to further examine the various characteristics of mobile coupons.

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◆ About the Authors ◆



Soonki Hwang

Soonki Hwang works for Onestore Corporation (app market in Korea) as a Mobile Commerce Business team leader. He received his Ph.D. from Yonsei University. His research interests are in the areas of mobile commerce, mobile push marketing, and mobile game marketing.



Jai-Yeol Son

Jai-Yeol Son is a Professor of Information Systems at Yonsei University, Seoul, Korea. He received his Ph.D. from the Georgia Institute of Technology and was formerly on the faculty of the Sauder School of Business at University of British Columbia. His research focuses on online user behavior, information privacy and security, and interorganizational systems. His research has appeared in journals including *MIS Quarterly*, *Journal of Management Information Systems*, *Journal of the Association for Information Systems*, *Information and Management*, and *International Journal of Electronic Commerce*.



Sunju Park

Sunju Park received her B.S. and M.S. in computer engineering from Seoul National University, Seoul, Korea, and the Ph.D. degree in computer science and engineering from the University of Michigan, Ann Arbor, MI, USA. She has served on the faculties of Management Science and Information Systems, Rutgers University, NJ, USA. She is a professor of Operations, Decisions and Information at School of Business, Yonsei University, Seoul, Korea. Her current research interests include analysis of online social networks, multiagent systems for online businesses, and pricing of network resources. Her publications include *Computers and Industrial Engineering*, *Electronic Commerce Research*, *Transportation Research*, *IIE Transactions*, the *European Journal of Operational Research*, the *Journal of Artificial Intelligence Research*, *Interfaces*, *Autonomous Agents and Multiagent Systems*, and other leading journals.



Kil-Soo Suh

Kil-Soo Suh is a professor of Information Systems at Yonsei University, Seoul, Korea. He holds a Ph.D. in Management Information Systems from the Kelley School of Business at Indiana University. His research interests are in the areas of interface design for electronic commerce, communication media, virtual reality and ethical challenges of information technologies. His work has been published in various journals including *Behaviour and IT*, *Decision Support Systems*, *Information and Management*, *Information Systems Research*, *International Journal of Electronic Commerce*, and *MIS Quarterly*.

Submitted: March 22, 2023; 1st Revision: June 15, 2023; Accepted: July 18, 2023