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Consumer's Quantified Self: Cost of Immediate Feedback

소비자의 자기 계량화: 피드백 시점의 효과

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ABSTRACT

Consumer's Quantified Self: Cost of Immediate Feedback

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The main objective of this research is to identify a negative consequence of consumer's "self-quantification" behavior in terms of its nature to constantly provide immediate feedback (i.e. measurement) of the activity's progress. As consumers are increasingly measuring and quantifying personal data via tracking devices, the current research aims to reveal that the timing of feedback (immediate vs. delayed) plays a significant role in undermining activity's enjoyment and subsequently the service's effectiveness perceived by the consumers. This study shows that delayed (vs. immediate) feedback increases perceived service effectiveness for promotion focused individuals because they are better motivated by internal standards, more specifically, their sense of flow and activity enjoyment. Thus, the current research compares two types of self-quantification with different feedback

timings (immediate vs. delayed) to demonstrate its significance on the perception of the service's effectiveness depending on the individual's regulatory focus.

Keywords: Self-Quantification, Feedback timing, Flow, Perceived service effectiveness

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INTRODUCTION

The ubiquity of technology has enabled access to all kinds of information about our personal lives. The number of hours slept, steps taken, and calories consumed can be easily accessed via tracking devices such as Fitbit, IWatch, and Jawbone. This trending behavior of collecting personal data with technology has been coined the "self-quantification movement". In fact, one in six (15%) of consumers in the United States currently use wearable tech in their daily lives and the global wearable devices market reached over $4 billion in market value as of 2017 (Statista, 2017). This movement can be attributed to the demand of customers seeking to change their daily hsabits to achieve a better, healthier life. As such, academic research on understanding the experiences undergone by users of self-quantification has also recently gained more traction (Pettinico & Milne, 2017a; Segar, 2017; Sharon & Zandbergen, 2017; Smith & Vonthethoff, 2017).

Pros and Cons of Self-Quantification

The upside of self-quantification is straightforward. The quantified information can serve as a direct source of positive feedback when pursuing a long-term goal (i.e. losing weight). Although the result of one day's worth of exercising might not be apparent when simply looking at the mirror, the quantified results (i.e. number of miles run, exercise duration) can help to motivate

consumers to persist in working out every day. Recent research show findings to support that this "quantification effect" serves to improve anticipated motivation via 1) enhancing feedback loop, 2) amplifying self-empowerment, and 3) strengthening goal focus (Pettinico & Milne, 2017b).

However, recent research has also revealed various drawbacks of self-quantification (Etkin, 2016; Toner, 2018; Tonietto & Malkoc, 2016). Etkin (2016) illustrate how quantifying the progress of activities can lower enjoyment level. Merely measuring how many pages the experiment participants read was enough to decrease the amount of enjoyment the participants derived from the reading activity (compared to the group of participants who read without any measurement salient). Tonietto and Malkoc (2016) introduce the concept of a 'calendar mindset' where quantifying leisure activities into a time bounded schedule makes the activity feel more like work. Further insight into how consumers react to self-quantification will help broaden our understanding their behaviors and offer a better product/service experience.

Current Research Purpose

The purpose of this research is not to simply reinforce the position that self-quantification can have a negative consequence when compared to the absence of self-quantification, but to reveal that the manner of self-quantification to immediately provide

constant feedback can be attributed to the negative aspects. Thus, this research compares two aspects of self-quantification (immediate vs delayed feedback) to support that, despite the intuitive reasoning that faster feedback is generally better, delayed feedback can bring about better outcome (i.e. greater sense of flow and higher perceived service effectiveness). The immediate and continuously salient nature of the quantified feedback (i.e. measurement of activity's progress) provided to the users can play a detrimental role in how they are involved in the activity and thus how they evaluate the product in use.

THEORETICAL BACKGROUND

Feedback Timing: Immediate vs. Delayed

The fundamental element of self-quantification is receiving feedback (i.e. data, measurements) of the quantified activity. Feedback has been defined as the provision of informative and actionable insight on the performance of a behavior (Sanders et al., 2016) or as the real-time feedback on a user's current progress(E. K. Choe, B. Lee, S. Munson, W. Pratt, & J. A. Kientz, 2013). Given that the feedback shown is the major point of interaction with the users, how such feedback should be presented to the user has been a popular topic of research. The manner in which the data is presented to the user, such as the visual design, units (raw or percentage) of the data, and framing of progress (amount completed

or remaining), has been a key focus of research on self-quantification (Choe, Lee, S. Munson, W. Pratt, & J. A. Kientz, 2013).

However, one overlooked element of receiving quantified feedback is the timing in which the data is presented to the user. The measured data is sometimes shown to the users in real-time (immediate feedback) during the activity and in other cases, the data is shown to the user after the completion of the activity (delayed feedback). The importance of feedback timing is a well establish topic of research in educational research. Based on reinforcement theory, the intuitive notion is that faster feedback is always better. However, receiving delayed feedback has also received spotlight as having more advantages in the learning process (Zapata, Kosheleva, & Kreinovich, 2017) (Thalheimer, 2007). Despite the commonly believed notion that immediate feedback is generally better, this counter-intuitive benefit of delayed feedback is a reoccurring theme in research (Mullaney, Carpenter, Grotenhuis, & Burianek, 2014; Sinha & Glass, 2015).

Perceived Service Effectiveness

Self-quantification can be perceived as a service provided to customers; it requires customers to participate in an activity, which in turn is quantified for better understanding of themselves. And what's important about customer evaluation of services is that it is highly dependent on their own personal usage experiences. Their perceived effectiveness of a service, the measure to which a

consumer believes the product/service accomplishes what it is supposed to do, depends on the objective qualities of the service but also the subjective experience had during its usage.

The feedback timing can have a significant influence on the subjective experience of activity, hence the perceived service effectiveness. If immediate feedback, due to the salience and immediacy of the measurements, can have a distracting effect on the customers experience with the service, it can also have a detrimental effect on the perceived effectiveness of the service. On the other hand, if the customers were better able to commit their focus onto the activity, the evaluation of the service's effectiveness will rise as well.

H1: Receiving delayed (vs. immediate) feedback will increase perceived service effectiveness.

Sense of Flow

The level of flow can help explain the effect that feedback timing has on the consumer's perceived service effectiveness. The first influential path made by self-tracking and feedback timing is its effect on the user's sense of flow(Lomborg, Thylstrup, & Schwartz, 2018). Flow, or the mental state of total immersion in an activity (Lee & Chen, 2010), can be decreased by the saliency of the feedback. The immediate and continuous presence of information regarding the activity's progress will disrupt the user's

level of involvement with the activity. Thus, we hypothesize that delayed feedback will elicit greater sense of flow and that this will also translate to greater enjoyment of the activity. The significance that flow and enjoyment has on product evaluation is also well studied in literature, especially in consumer's sense of flow in internet shopping experiences (Cai & Xu, 2006; Guo, 2003). Thus, these two main factors, flow and enjoyment, will play an active role in increasing the perceived service effectiveness.

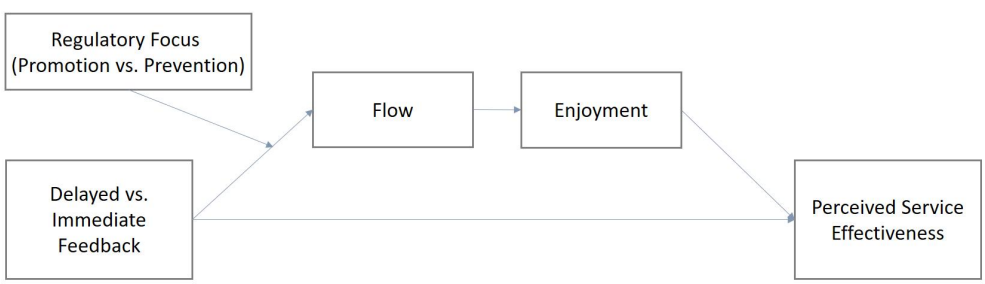
H2: Higher perceived service effectiveness in response to delayed feedback will be mediated by higher sense of flow and, as a consequence, higher levels of enjoyment.

Influential Role of Regulatory Focus

The level of flow experienced by the customers is expected to vary among different individuals. The regulatory focus theory, which explains the relationship between the motivation of the individuals and the way in which they go about achieving their goals (Higgins, 2000), is expected to play a critical role to the level of flow the individuals experience. The key conceptualization of regulatory focus is that promotion (vs. prevention) focused individuals are more motivated to pursue gains (vs. avoid losses) and more likely to be motivated by internal (vs. external) standards (Summerville & Roese, 2008). Thus, when promotion focus individuals receive delayed feedback and not distracted by the constant updates of immediate feedbacks, their motivation to pursue

the activity based on internal standards (i.e. flow and enjoyment) will increase. However, when they received immediate feedback that constantly alert them of their progress updates, the tendency of promotion focused individuals to pursue the gains of the measurements will distract them from achieving a higher sense of flow. In fact, research on regulatory focus reveal that promotion (vs. prevention) focus individuals are more susceptible to distractions (Freitas, Liberman, Salovey, & Higgins, 2002; Leroy & Schmidt, 2016). The introduction of regulatory focus in this research helps to highlight the crucial role that the consumer's sense of flow plays in distinguishing the consequences of delayed and immediate feedback and in subsequent evaluation of services.

H3: The increase in flow due to receiving delayed (vs. immediate) feedback is greater for promotion (vs. prevention) focused individuals.



<Figure 1: Research Model>

STUDY 1

The purpose of Study 1 is to first validate the effect that feedback timing has on perceived service effectiveness. The service of evaluation in this study is a personality test that records and analyzes the user's answers to provide an accurate personality type within the MBTI's 16 central personality types. Within this condition that all users are aware that their activity is being quantified, the presence or absence of immediate feedback is expected to have a significant difference on the user's evaluation of how well the product was effective in serving its purpose. More specifically, the salience of the immediate feedback (i.e. the number questions answered so far) will play a negative role in perceived service effectiveness (i.e. how well the personality test will provide the individual's true personality), because it will lower users' engagement in the activity.

Study 1 Method

100 participants were recruited using Amazon Mechanical Turk in return for a small compensation of .50 USD. The study was described as an opportunity for participants to take an official personality test based on MBTI standards, allowing them to discover and learn about the fundamental traits that make them who they are. One important element in this study was that the participants were given the option to answer as many questions as

they would like to answer before ending the personality test. The participants were asked to continue answering questions until they feel that they have adequately portrayed their personality with the number of questions they answered. In order to make sure that both groups were fully aware that their activity is being quantified, the study also clarified that the number of questions answered will be recorded for analysis and displayed to them at the end of the personality test.

The participants were given a series of questions based on Myers–Briggs Type Indicator (Myers, McCaulley, Quenk, & Hammer, 1998). Questions such as "You find it difficult to introduce yourself to others," "You care about what people think about you," and "Watching emotional films make you feel sad," were shown to participants through a series of separate pages. Most essentially, the participants were divided into different feedback timing groups (immediate feedback vs. delayed feedback). The immediate feedback group were shown the total number of questions answered so far on each page of question that they answer. "You have answered X questions" was displayed on each page as they were given the option to move on the next page to answer more questions. The delayed feedback group was not shown this feedback of how many questions were had answered so far (See Appendix).

On each page of personality questions, the option to end the personality test was provided on the bottom of the page. Once the participants felt they were satisfied with the number of questions

that they have answered so far, they were given the option to stop and move on to the next section of the study. After ending the personality test, the participants were measured on their perceived effectiveness of the service using a scale developed by Chae, Li, and Zhu (2013). The questions asked on a scale of 7 were, "How much do you believe that this test will work in providing your true personality?" (not at all/very much), "How reliably do you expect this test will work in providing your true personality?" (very unreliable/ very reliable), and "How effective do you think this test will work in providing your true personality?" (not effective all at all/very effective). Lastly, the participants were asked to provide their age, sex, and any prior experience taking an MBTI personality test in the past. At the very end of the study, the participants were given their results of one of the 16 personality types.

Study 1 Results

The three-item measure for perceived service effectiveness was combined to create a single index of perceived service effectiveness (alpha = .97). A one-way ANOVA for feedback timing (immediate vs. delayed) revealed a significant main effect on the perceived service effectiveness ($F(1,99) = 7.164$, $p < .01$). Receiving delayed feedback of the personality test taking activity increased the perceived effectiveness of the personality test ($M_{delayed} = 4.6$) compared to the immediate feedback group ($M_{immediate} = 3.7$).

<Figure 2: Effect of Feedback Timing on Perceived Service Effectiveness >

Study 1 Discussion

Study 1 provides initial evidence in support of Hypothesis 1, that receiving delayed (vs. immediate) feedback will increase perceived service effectiveness. It is important to note that both groups, immediate and delayed feedback group, were aware that their activity was being quantified. This means that the difference in perceived service effectiveness between the two groups cannot be attributed to the quantification effect as found in previous research studies (Etkin, 2016), but to the salience of the activity's feedback that the participants received. Study 1 results provide preliminary

evidence that part of the negative effects of self-quantification can mitigated by providing slower feedback that does not distract the consumer during activity pursuit.

STUDY 2

The purpose of Study 2 is to reveal the internal process that is responsible for the difference in perceived service effectiveness due to feedback timing. The reason for the increase in perceived effectiveness is attributed to the individuals sense of flow and enjoyment of the activity. Moreover, given that flow and enjoyment are internally motivating variables, the study finds that regulatory focus will also play a significant role in deciding the magnitude of the effect found in Study 1. The service of evaluation for this study is a movie recommending service that records the ratings of recent movies viewed by the users. Similar to Study 1, the participants were given the choice to continue rating as many number of movies they wanted into the movie recommending system before choosing to end the activity.

Study 2 Method

211 valid participants were recruited by Embrain to perform a 2 (feedback timing: immediate vs. delayed) x 2 (regulatory focus: promotion vs. prevention) between subjects design. All the participants were first divided into either the promotion or

prevention focus group conditions. The regulatory focus was manipulated via priming methods in a seemingly "separate" study. The participants in the promotion focus group condition were asked to record a positive outcome they wish to achieve and to describe the strategies that they might use to achieve this outcome. The participants in the prevention focus group condition were asked to write down a negative outcome they wish to achieve and to describe the strategies they might use to avoid this outcome. Upon finishing the task, they also responded to two questions ("To what extent did you focus on achieving/avoiding the positive/ negative outcome when writing down the strategies.") to confirm the conditions' validity.

After the end of the regulatory focus manipulation task, the participants were asked to participate in a movie recommendation service task. Similar to users of apps such as Netflix and Whacha, the participants were asked to rate movies that they had seen recently in order to receive a movie recommendation given by the program. Very much like Study 1, the difference between the two feedback timing conditions (immediate vs. delayed) was whether the participants were shown how many movies they had rated so far in the screen in front of them (See Appendix). After the end of the movie rating task, the participants were asked to answer questions on their perceived service effectiveness (Chae et al., 2013) ("How much do you believe that this movie recommendation system will recommend you a good movie", "How reliably do you expect this movie recommendation system to recommend you a good movie?",

"How effective do you think the movie recommendation system will be in recommending you a good movie?"), task enjoyment (Etkin, 2016) ("To what extend did you find the movie rating experience… enjoyable, boring, interesting, a waste of time, and fun"), and sense of flow (Csikszentmihalyi, 1997) ("My attention was focused entirely on what I was doing", "It was no effort to keep my mind on what was happening", "I had total concentration").

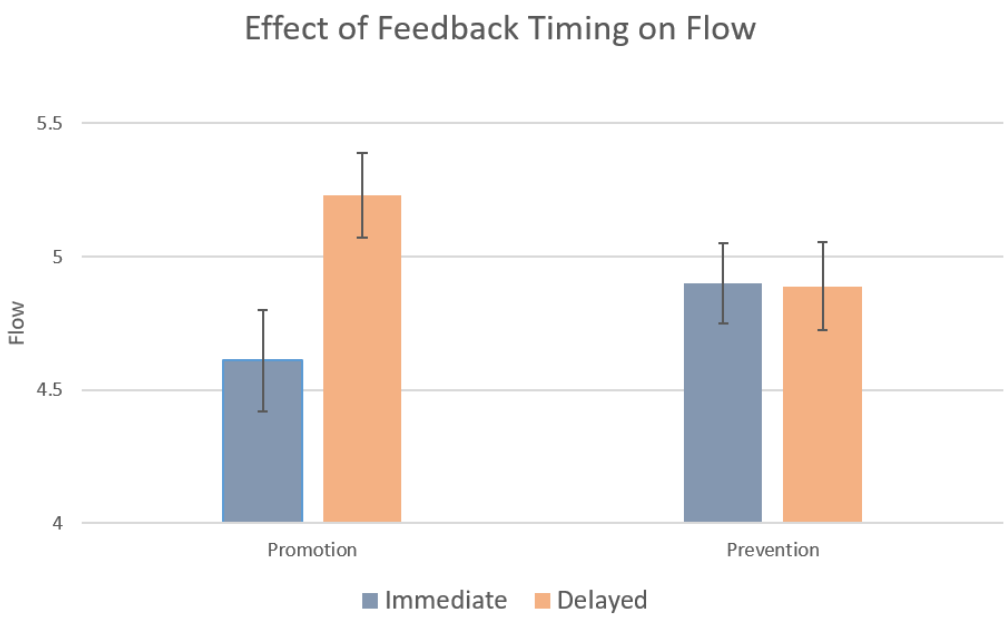
Study 2 Results

A one-way ANOVA for feedback timing (immediate vs. delayed) revealed an no significant main effect on the perceived service effectiveness ($F(1,210) = .2$, NS). However, further analysis into the role that regulatory focus plays in playing a moderating effect on the path to perceived service effectiveness revealed significant findings.

A manipulation check first was also performed to confirm the significance of the difference between the two regulatory focus groups (promotion focus vs. prevention focus). The results revealed satisfactory difference for the promotion focus manipulation check measures ($M_{promotion} = 5.19$, $M_{prevention} = 4.67$, $F(1, 210) = 9.64$, $p < .01$) and for the prevention focus manipulation check measures ($M_{promotion} = 3.92$, $M_{prevention} = 4.88$, $F(1, 210) = 29.22$, $p < .001$).

A 2 (feedback timing: immediate vs. delayed) vs 2 (regulator focus: promotion vs. prevention) ANOVA for flow revealed a significant interaction ($F(1,207) = 4.12$, $p = .04$).

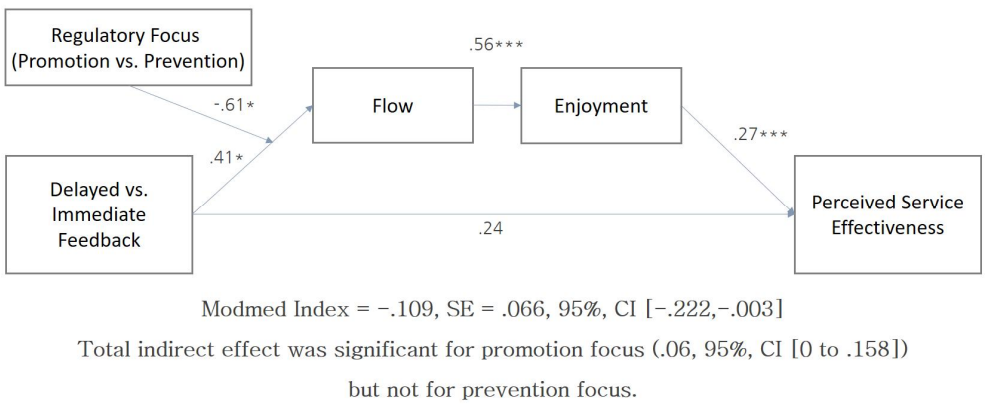
Furthermore, planned contrast revealed a clear significant effect between the immediate feedback group and delayed feedback group within the promotion focused individuals ($M_{immediate}$ = 4.75 SD = 1.17 vs. $M_{delayed}$ = 5.17, SD = 1.1, p = .048)



<Figure 3: Moderating Role of Regulatory Focus on Flow>

A mediation analysis using PROCESS (Hayes, 2017) was performed to examine whether the effect of feedback timing on perceived service effectiveness is mediated by flow and enjoyment. Whether the higher perceived service effectiveness in response to delayed feedback is mediated by higher sense of flow and

enjoyment was tested by performing a moderated serial mediation, model 85 (Hayes, 2017). The result of bootstrapping analysis of 5,000 samples confirmed a significant index of moderated mediation (*MedMod* Index = −.109, SE = .066, 95%, CI [−.222, −.003]), where the promotion focused group showed significant mediation (*b* = .06, SE = .06, 95%, CI = [0, .158]), but showed insignificant mediation for the prevention focused group.



<Figure 4: Moderated Serial Mediation, Hayes Model 85>

Study 2 Discussion

The findings of Study 2 reveals that the individuals' higher sense of flow and enjoyment is responsible for the increase in perceived service effectiveness when exposed to delayed feedback timing. In other words, it can be said that providing immediate feedback of an activity can lower the level of flow experienced by the individual. The salience of the feedback can play a negative role

in distracting the individuals from fully committing to the activity, and consequently decrease the general evaluation of how effective the service perceives to work.

Another important finding is that regulatory focus plays a significant role in revealing a boundary condition. The definition of promotion focused mindset state that the individuals are internally driven while prevention focused people are driven by external standards. Since flow and enjoyment are individual motivations that are internally reinforcing, the effects of its influence are found to be greater for people who have a promotion focused mindset. Moreover, in support of literature that finds promotion focused individuals to be more susceptible to distractions, our research found that they were also more distracted by the immediate feedback and subsequently perceived lower service effectiveness.

GENERAL DISCUSSION

The result of the study showed that receiving delayed feedback from activities can be better than receiving immediate feedback, especially for promotion focused individuals. Receiving immediate feedback is detrimental as it lowers the consumer's sense of flow and enjoyment. The current research model supports that delayed (vs. immediate) feedback increases flow and enjoyment and thus increases the perceived service effectiveness for promotion focused individuals, because they are better

motivated by internal standards.

Most importantly, the current research is not to simply reinforce the position that self-quantification can have a negative consequence when compared to the absence of self-quantification, but to reveal that the manner of self-quantification to immediately provide constant feedback can be attributed to the negative aspects. Thus, this research compared two aspects of self-quantification (immediate vs delayed feedback) to support that, despite the intuitive reasoning that faster feedback is generally better, delayed feedback can elicit better outcome of greater task enjoyment and higher perceived service effectiveness.

RESEARCH IMPLICATIONS

The theoretical implication of this research can be evident in advancing our knowledge of how self-quantification affects consumers. The decrease in task enjoyment due to self-quantification can be attributed to the salience of the feedback given to the user. Moreover, despite the intuitive notion that faster feedback is better for reinforcing behavior, the excessively salient and immediate nature of feedback can also have consequences.

The immediate practical implication of this research is to serve as a potential warning to technology-based companies to cut down on the saliency of the immediate and constant feedbacks that are pushed to their tech users. Although it might be tempting to

provide all and every information to the users in the shortest time, cutting back on the salience of self-quantification might be more helpful in to customers in indulging in their activities with greater enjoyment. Product and service providers that provide consumer's quantified activity should be wary of potential drawbacks of providing too much feedback, as it can decrease both enjoyment of the activity and their perception of the product/service effectiveness

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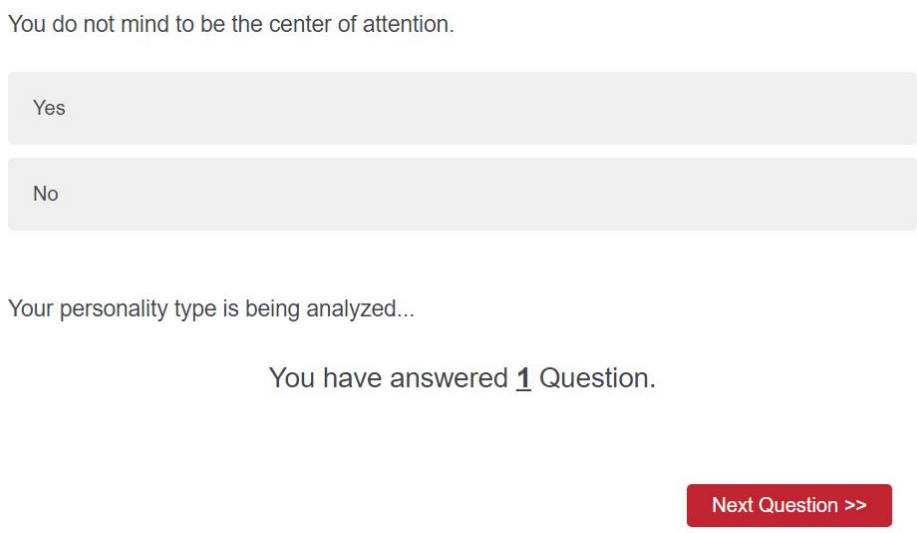
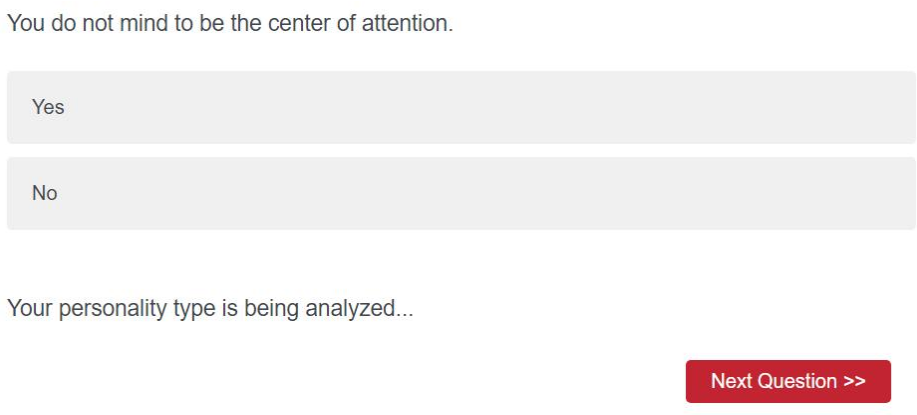
APPENDIX

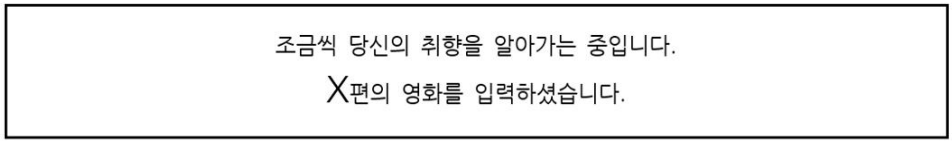
Immediate Feedback Condition (Study 1)



Delayed Feedback Condition (Study 1)



Immediate Feedback Condition (Study 2)



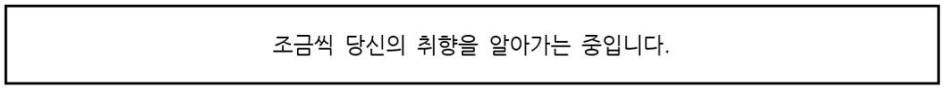
영화 제목: _____

별점: ☆☆☆☆☆

(Translation: “Your preference is gradually being understood.

“You have rated X number of movies”)

Delayed Feedback Condition (Study 2)



영화 제목: _____

별점: ☆☆☆☆☆

(Translation: “Your preference is gradually being understood.)

국 문 초 록

소비자의 자기 계량화: 피드백 시점의 효과

허 경 태

경영학과 경영학 전공

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이 연구의 주 목적은 소비자의 “자기 계량화” 행동의 부정적인 결과를 확인하는 것이다. 소비자에게 “자기 계량화”행동의 피드백을 제공하는 시점이 즉각적일수록(vs. 지연될수록) 활동의 즐거움(activity enjoyment)이 떨어지고, 결국 소비자들이 인식하는 서비스의 효과(perceived service effectiveness)가 낮아진다. 또한, 피드백이 지연될수록 촉진 초점(promotion focus)을 가진 소비자들이 서비스 효율성을 더 높게 인식한다. 그 이유는 촉진 초점을 가진 소비자들이 내부적인 기준(i.e., 플로우 및 즐거움)에 의해 더 동기 부여를 받기 때문이다. 즉, 본 연구는 자기 계량화의 유형(즉각적 vs. 지연된 피드백)에 따라 소비자들이 인식하는 서비스 효과가 달라진다는 사실을 보여준다.

주요어 : 자기 계량화, 피드백 시점, 플로우, 서비스 효과

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