Determinants of Technology-Based Self-Service Acceptance

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Abstract The spread of the COVID-19 has amplified the use of non-face-to-face service due to the psychological risk of contact. As a result, non-face-to-face service is being presented in a new paradigm that will lead the post-corona era, and the importance of this will be further increased. In particular, the service industry, which had been face-to-face transaction, has made remarkable progress and is highly utilized in the restaurant industry. Therefore, the purpose of this study is to explore the factors that affects the acceptance intention of technology-based self-service of food and beverage store customers. In the survey, we conducted a questionnaire survey of customers who had used technology-based self-service at coffee shop. Hypothesis test was done using AMOS statistical programs. The results of this study have academic implications for investigating the antecedent variables to the acceptance intention of technology-based self-service in uncertain environments. In practice, it will contribute to decision-making and business strategy formulation for the post-corona era.

Keywords TBSS (Technology-based self-service) · VAM (Value-based adoption Model) · Perceived value · Attitude · Acceptance intention

1 Introduction

COVID-19 has influenced across the world on the way of life including the daily routine of individual. For that, it serves as a motive that the face-to-face service enterprise concentrates on the digitalization for the non-face-to-face service more [1]. Particularly, the digitalization was accelerated in the food service area and retail area, which is because of the fact that COVID-19 spreads by the human contact
and the social distancing campaign [2], for which the non-face-to-face consumption culture is being spreading. Example of non-face-to-face consumption us self-service encounter, online purchasing, online payment, kiosk, etc. [3].

The food service businesses and the retail businesses, which have invested proactively in the non-face-to-face in our country, showed the pattern that the sales are rather increased during the period that COVID-19 was spreading rapidly. Ono-face-to-face order and payment system of Starbucks Korea can be the representative example. Starbucks Korea is providing ‘Siren Order’, which is the non-face-to-face service based on the technology that it has developed independently. ‘Siren Oder’ is the service that the customer can receive the beverage personally after selecting and paying the desired beverage through dedicated APP and can minimize the contact with the employee. The number of order received through ‘Siren Order’ from January to February, 2020 was more than 8 million and increased by 25% compared to the same period of 2019 [4].

‘Siren Order’ of Starbucks Korea is a sort of TBSS (Technology-based Self-service) and corresponded to Smart Ordering System. TBSS means the technology service that the consumer can participate directly to the service production through machine or internet, etc. without help of employee [5]. Recently, in the food and beverage store, Smart Ordering System is utilized actively [6]. Smart Ordering System has advantage that it takes short time from ordering to payment through the mobile devices possessed by the individual and can minimize the communication error. However, in the position of business, since the initial cost is incurred by the customized software development by enterprise and authentication [6] and there is no installation-related cost transferred to consumer, if the user wants, the user can stop using the service any time.

Therefore, to TBSS like smart ordering system, forecasting the intention if the user would use relevant technology is essential. In addition, various researches on the kiosk that minimizes the contact through the device installed in specific location have been made but the research on the smart ordering system, which TBSS is realized through mobile devices carried by user is not enough.

Therefore, the purpose of this study is to verify the factors having impact on the TBSS acceptance intention empirically focusing on the smart ordering system. To do that, this study established the research model based on the value-based adoption model saying that considering the technology user as consumer, the value perceived from technology would increase the technology acceptance intention, and to examine the relations by drawing key factors based o preceding research. In the meantime, since most of the smart ordering systems in the food and beverage store do not incur the initial installation cost in the user, have been introduced for the convenience of use and its technology is not complicate, the key factor was limited to the benefits.

The results of this study are expected to provide the information what are the factors that the users consider as important to the organization, which wants to introduce the smart ordering system as a part of TBSS at the time of preparing post COVID era.
2 Theoretical Background and Hypotheses

2.1 TBSS (Technology-Based Self-Service)

TBSS means the service that allows the consumer to participate directly in the service production through the machine or technology such as internet, etc., without help of employee [5]. Touch screen, self-scanning, ATM, internet banking, mobile banking, chatbot, etc., are considered as TBSS. Recently, as the mobile devices like smartphone become an important interface of TBSS by the increase of availability of Wi-Fi, Bluetooth, etc., new mobile-based TBSS is emerged [7]. Therefore, in the food service industry, the mobile-based smart ordering system is included as a type of TBSS [6].

Smart ordering system composed of 3 elements. First, the user must have Web Ordering System in his/her smartphone. Next, it should have Menu Management System to be able to select menu and Order Retrieval System that the employee can see the order details ordered by user [8]. As such, the smart ordering system has a hassle that the user must install the system in the personal mobile device.

Nevertheless, the reason why the user prefers to TBSS like smart ordering system is because of the speed and convenience taken to make order, cost saving, fun, minimization of communication error, minimization of unnecessary meeting with employee, etc. [5, 6]. In our country, ‘Siren Order’ of Starbucks can be the representative example of smart ordering system. ‘Siren Order’, which was TBSS developed independently by domestic Starbucks, is the service that the customer can select and receive the desired beverage after payment through dedicated APP. Particularly, since it is designed to select the personal option for product, the individual customized service is possible. In addition, through the APP notice, the information such as various event benefits, promotional beverage, etc., are provided [9]. Therefore, in this study, the factors having influence on the mobile device-oriented TBSS acceptance intention will be examined using Siren Order of Starbucks.

2.2 VAM (Value-Based Adoption Model)

As the representative theory on the process that the user is accepting specific technology, there is TAM (Technology Acceptance Model) suggested by Davis et al. [10]. However, TAM has limitation that it could not include the general consumer as a subject of accepting technology. To overcome such limitation, VAM (Value-based Adoption Model) was emerged trying to explain by what the service consumer accepts the technology [11]. VAM defined the IT technology user as consumer and focused on maximizing the personal value of the consumer [11]. Kim et al. [11] tried to explain the acceptance of technology and service based on the concept of perceived value by Zeithaml [12]. Therefore, the perceived value from the new technology becomes importance antecedent for technology acceptance intention.
In the meantime, the consumer experiences the benefit and sacrifice obtained by using IT technology before perceiving comprehensive value. Therefore, both the benefit and sacrifice should be considered as an element having influence on the value in accepting the technology and in VAM, the usefulness and enjoyment were suggested as element of benefit and the technicality and perceived fee were as the element of sacrifice [11, 13].

The usefulness means the degree that new technology is useful in the daily life or business, etc. and it is the similar concept to the functional advantage of product or service use [11, 14]. The usefulness of the technology can improve the ability of carrying out the work and makes the decision making easy [14]. Therefore, the more the new technology is perceived as useful, the higher the value of the technology can be perceived, which is proved in the research related to the multiple technology acceptance [11, 14, 15].

Enjoyment means the degree of pleasure, joy and satisfaction felt using new technology [10, 11]. The person who experiences the pleasure and joy by using the technology is highly likely to accept the technology and use widely by perceiving the value of the technology highly [10]. Therefore, the multiple researches utilize the enjoyment as major predictor of the perceived value [15–17].

Technicality is the degree of perceiving technically superior in the process of providing services and is determined by the system reliability, connectivity and efficiency [11]. If in the position of technology user, the use of technology is felt difficult and the time to connect it is taken longer, it is recognized as cost and causes the negative mental state. However, on the contrary, if the use of technology is not complicate and easy, the positive value can be formed. The research results that the complexity of the technology has negative influence on the perceived value supports it [15].

Perceived cost is paying the monetary consideration, which includes the actual price of the product or service, and measured with the consumer’s perception on the cost actually paid [11]. If the cost paid to use the technology is perceived high, negative perception can be formed. On the contrary, the more the cost is saved or additional benefit is increased, the perceived value can be increased [18]. As the smart ordering system, the object of this study, does not generate the cost related to use of system besides the existing price of product ad provides the benefit such as accumulation of point, issuance of coupon, etc., it will be used by changing to cost advantage. In the meantime, the research by Kwon and Seo [19] showed that the economic feasibility has positive influence on the perceived value.

Through the aforementioned contents, it was expected that the usefulness, enjoyment, technicality and the cost advantage would have influence on the perceived value of the technology-based self-service in the food and beverage store and following hypothesis was drawn.

H1. Perceived benefit will have a positive effect on the perceived value.

Perceived value means overall evaluation on the product or service utility [12] and is emphasized as a key antecedent determining the consumer’s attitude or behavior [20]. For example, the research that explains the acceptance of the service combined with new technology such as mobile hotel reservation system [21], IPTV [22], e-book subscription service [23], IoT smart home service [24], VR [15], etc. proved
that the perceived value is important predictor of acceptance intention. Therefore, it can be expected that in case of the user perceiving the value of TBSS, the acceptance intention would be increased and following hypothesis was established.

H4. Perceived value will have a positive effect on acceptance intention.

### 2.3 VAB (Value-Attitude-Behavior) Model

As the model predicting consumption behavior of the consumer, there is VAB (Value-Attitude-Behavior) Model. VAB Model suggested by Homer and Kahl [25] is the model useful in predicting the consumption behavior and is the theory that the consumer’s behavior is formed through the value and attitude.

Attitude in VAB Model plays the mediating role between the abstract value and specific behavior [25]. Attitude is the learned emotional inclination relatively formed consistently on the specific target and means the psychological reaction appeared favorably or unfavorably through the experience [26]. Dabholka and Bagozzi [27] defined the attitude as the experiential evaluation such as good or bad, pleasant or unpleasant, etc. Therefore, in order to form the attitude, the cognitive reaction like value perception should be preceded.

Since the value means overall evaluation on the utility of product or service according to Zeithaml [12], it is viewed as single dimension but is viewed as multi-dimensional perspective depending on the researcher [28]. While the approach to the single dimension has overall character of practical aspect, in case of approaching to multi-dimension, it has strong complex characters of psychological, cognitive and emotional dimension [29]. In the multi-dimensional structure, utilitarian value, hedonic value, acquisition value, transaction value, use value, functional value, emotional value, social value, etc. are used [28, 30, 31]. If multi-dimensional structure is examined, it is observed that the aspect of diverse benefits obtained by the experience is considered.

Therefore, it can be expected that the benefit element of technology use drawn according to VAM (usefulness, enjoyment, technicality, cost advantage) also have significant influence on the attitude. Gan and Wang [32] examined the influence on the attitude by establishing the benefits of social commerce as value. Therefore, following hypotheses were drawn.

- H2. Perceived benefit will have a positive effect on the attitude.
- H3. Perceived value will have a positive effect on the attitude.

The attitude influenced by the value influences on the consumer’s behavior [24]. Dabholka and Bagozzi [27] verified that the behavior life decision making is influenced by the attitude. Karjaluoto et al. [33] suggested in the research on the mobile banking acceptance intention that the attitude can become a powerful antecedent, and Alotaibi [34] proved that the attitude has influence on the cloud computing acceptance. The research on Home Smart IoT service by Kim et al. [24] demonstrated that the attitude is the major influential factor of the acceptance intention, through
| Category and items | Sample size | Ratio (%) |
|--------------------|-------------|-----------|
| Gender             |             |           |
| Female             | 127         | 53.8      |
| Male               | 109         | 46.2      |
| Age                |             |           |
| 20–29              | 74          | 31.4      |
| 30–39              | 109         | 46.2      |
| 40–49              | 40          | 16.9      |
| More than 50       | 13          | 5.5       |
| Frequency of use (recent 6 month) |         |           |
| 1–2                | 100         | 42.4      |
| 3–4                | 46          | 19.5      |
| 5–6                | 26          | 11.0      |
| More than 7        | 64          | 27.1      |

which it was inferred that the attitude would improve the intention of accepting new technology and following hypothesis was drawn.

H5. Attitude will have a positive effect on the acceptance intention.

3 Research Method

3.1 Sample and Data Collection

In order to verify the proposed model, we conducted a questionnaire survey for customers who have used the smart order system (siren order) in Starbucks Korea. As a result of the survey, 250 questionnaires were collected, and 236 cases were selected as valid samples after eliminating missing or inadequate data. The samples of this study are summarized in Table 1.

3.2 Measures

For the content validity of the measurement tool, measurement items that have already been verified in previous studies were derived and modified to suit the purpose of this study. In this study, usefulness, enjoyment, technology, cost advantage, perceived value, attitude, and acceptance intention were set as the main concepts. For tools to measure the concept, studies by Kim et al. [11], Lin et al. [22], Yu et al. [14], and Kim et al. [24] were referenced, and then measured them by the Likert Five-point scale (from Not at all to Very Much). The measurement items in this study are summarized in Table 2.
Table 2  Confirmatory factor analysis based on reliability

| Variable     | Measurement items                              | Factor L.D. | C.R.  | Crb. Alpha |
|--------------|------------------------------------------------|-------------|-------|------------|
| Usefulness   | Reduction of time required                      | 0.783       | 0.944 | 0.893      |
|              | Helped to achieve the desired purpose           | 0.845       |       |            |
|              | Usefulness of the order method                  | 0.836       |       |            |
|              | Usefulness of payment method                    | 0.836       |       |            |
| Enjoyment    | Amusement                                       | 0.882       | 0.897 | 0.895      |
|              | Attractive                                      | 0.824       |       |            |
|              | Pleasure                                        | 0.876       |       |            |
| Technicality | Ease of use                                     | 0.798       | 0.914 | 0.868      |
|              | Available anywhere                              | 0.861       |       |            |
|              | Less occurrence of problems                     | 0.829       |       |            |
| Cost advantage| Economic benefits                              | 0.793       | 0.898 | 0.811      |
|              | Reasonable price                                | 0.864       |       |            |
| Perceived value| Value for money invested                      | 0.828       | 0.921 | 0.879      |
|              | Benefits for the effort invested                | 0.837       |       |            |
|              | Overall value                                   | 0.856       |       |            |
| Attitude     | Prefer ordering through Siren order             | 0.643       | 0.901 | 0.770      |
|              | Satisfaction with the services provided         | 0.787       |       |            |
|              | Overall positive experience                     | 0.767       |       |            |
| Acceptance intention| Want to use it in the future                | 0.836       | 0.903 | 0.826      |
|              | Will be used when ordering in the future        | 0.793       |       |            |
|              | Want to use even if there are competitors       | 0.722       |       |            |

3.3 Analysis Method

For hypothesis testing, we first carried out measurement model analysis for validity and reliability analysis, and then structural equation model analysis using Amos v.22.0 program.
Table 3  Discriminant validity

| Variable          | 1   | 2   | 3   | 4   | 5   | 6   | 7   |
|-------------------|-----|-----|-----|-----|-----|-----|-----|
| 1. Usefulness     | 0.899$^{a}$ |     |     |     |     |     |     |
| 2. Enjoyment      | 0.115 | 0.862$^{a}$ |     |     |     |     |     |
| 3. Technicality   | 0.093 | 0.196 | 0.884$^{a}$ |     |     |     |     |
| 4. Cost advantage | 0.491 | 0.134 | 0.166 | 0.903$^{a}$ |     |     |     |
| 5. Perceived value| 0.393 | 0.217 | 0.564 | 0.489 | 0.892$^{a}$ |     |     |
| 6. Attitude       | 0.490 | 0.150 | 0.411 | 0.508 | 0.596 | 0.868$^{a}$ |     |
| 7. Acceptance intention | 0.406 | 0.176 | 0.486 | 0.493 | 0.649 | 0.579 | 0.871$^{a}$ |

Note $^{a}$ square root of AVE (Average Variance Extract)

4  Analysis and Results

4.1 Measurement Model

Confirmative factor analysis was conducted to secure the reliability and validity of the measurement tool. For this, standard $\chi^2/df$, RMSEA, GFI, NFI, TLI, CFI were used to check goodness of fit. As a result of confirmatory factor analysis of measurement model, $\chi^2/df = 1.21(\leq 3)$, RMSEA = 0.03($\leq$0.05), GFI = 0.927($\geq$0.9), NFI = 0.934($\geq$0.9), TLI = 0.985($\geq$0.9), CFI = 0.988($\geq$0.9) all indicators were found to be suitable. After verifying measurement model’s fitness, reliability and validity were analyzed. Reliability is examined by accessing construct reliability (C.R.). C.R. ranges from 0.897 to 0.944, exceeding the cut-off value of 0.7 for C.R. Validity is was evaluated by average variance extracted (AVE), and it was found to be 0.744–0.815, exceeding the standard value of 0.5. Additionally, to identify the discriminant validity, the square root of the AVE for each construct is compared with the correlation coefficients between two constructs [35, 36]. When the AVE square root is larger than the correlation coefficient, it is determined that the discrimination validity is secured. As a result of analysis, reliability and validity were verified and the detailed results are presented in Tables 2 and 3.

4.2 Structural Model

The fitness of the measurement model and the reliability and validity of the measurement tool were confirmed to be normal, and the structural model was analyzed. As a result of structural model’s fitness test, $\chi^2/df = 1.225(\leq 3)$, RMSEA = 0.031($\leq$0.05), GFI = 0.925($\geq$0.9), NFI = 0.932($\geq$0.9), TLI = 0.984($\geq$0.9), CFI = 0.987($\geq$0.9), all of which were above the baseline.
4.3 Hypotheses Tests

Structural equation model analysis was performed to verify the hypothesis of the proposed model. As a result, first, Usefulness ($\beta = 0.149$, C.R. = $2.210$), Technicality ($\beta = 0.548$, C.R. = $8.572$) and Cost advantage ($\beta = 0.386$, C.R. = $5.518$) have a positive effect on Perceived value, therefore, H1a, H1c and H1d were supported. On the other hand, Enjoyment ($\beta = 0.047$, C.R. = $0.887$) did not have a positive effect on Perceived value, therefore, H1b was not supported. Second, Usefulness ($\beta = 0.265$, C.R. = $3.425$), Technicality ($\beta = 0.246$, C.R. = $2.631$) and Cost advantage ($\beta = 0.278$, C.R. = $2.903$) have a positive effect on Attitude, therefore, H2a, H2c and H2d were supported. However, Enjoyment ($\beta = -0.018$, C.R. = $-0.315$) did not significantly affect Attitude, therefore, H2b was not supported. Third, perceived value($\beta = 0.289$, C.R. = $2.422$) was shown to have a positive effect on attitude, and Hypothesis 3 was supported. Fourth, perceived value($\beta = 0.482$, C.R. = $4.875$) was shown to have a positive effect on acceptance intention, therefore H4 was supported. Finally, it was confirmed that attitude($\beta = 0.401$, C.R. = $3.864$) had a significant positive(+) effect on acceptance intention. Thus, H5 was supported. The results of hypotheses test are summarized in Table 4.

| H  | Path                          | Estimate ($\beta$) | C.R. (t) | Result   |
|----|-------------------------------|--------------------|----------|----------|
| H1a| Usefulness → Perceived value  | 0.149              | 2.210*   | Supported|
| H1b| Enjoyment → Perceived value   | 0.047              | 0.887    | Not supported |
| H1c| Technicality → Perceived value| 0.548              | 8.572*** | Supported |
| H1d| Cost advantage → Perceived value| 0.386             | 5.518*** | Supported |
| H2a| Usefulness → Attitude         | 0.265              | 3.425*** | Supported |
| H2b| Enjoyment → Attitude          | -0.018             | -0.315   | Not supported |
| H2c| Technicality → Attitude       | 0.246              | 2.631**  | Supported |
| H2d| Cost advantage → Attitude     | 0.278              | 2.903**  | Supported |
| H3 | Perceived value → Attitude    | 0.289              | 2.422*   | Supported |
| H4 | Perceived value → Acceptance intention | 0.482 | 4.875*** | Supported |
| H5 | Attitude → Acceptance intention | 0.401           | 3.864*** | Supported |

*p < 0.05; **p < 0.01; ***p < 0.001
5 Conclusions

5.1 Summary and Discussion of Results

This study intended to draw the influential factor based on the VAM (Value-based Adoption Model) and VAB (Value-Attitude-Behavior) model and to identify the structural relations among variable in order to identify the factors of promoting the user’s acceptance intention of TBSS, which is receiving the attention by the risk recognition on the contact due to COVID 19 virus. Particularly, Smart Ordering System, which is being introduced actively in the store specialized in beverage of food service sector was examined intensively. Therefore, the study was performed focusing on ‘Siren Order’ of Starbucks Korea, which was developed independently by the enterprise and already has multiple users. The summary of research results are as follows.

However, the enjoyment appeared not to have significant influence on the perceived value and the attitude, which means the more it is believed that Smart Ordering System would help the user in the life by using it, the easier how to use and the less failure and the more it is perceived that the economic benefits are provided, the more the value perceived comprehensibly and the attitude toward the technology are improved. Second, it was confirmed that the perceived value has significant positive (+) effect on the attitude, which means that the better the value of new technology, the more positive attitude is formed. Third, as the perceived value and the attitude appeared to have significant positive (+) effect on the acceptance intention, it supports the results of preceding researches [15, 21–24, 33, 34].

5.2 Implications and Limitations

The academic implications of this study are as follows. First, in the circumstance that the empirical research on Smart Ordering System, a kind of TBSS, is not enough, the theoretical system, that explains the intention that the user would accept the relevant technology, was prepared. Second, this study has meaning that the influential relations among the concepts were identified by applying VAM (Value-based Adoption Model), which examines the influential factor in the aspect of perceived value by the user in accepting new technology, and VAB (Value-Attitude-Behavior) Model, which the consumer’s behavior is receiving the influence by the value and the attitude.

Practical implications are as follows. First, from the fact that the usefulness, technicality, cost advantage suggested as benefit by the technology in VAM have positive influence on the perceived value and the attitude toward Smart Ordering System, the need of design to be able to emphasize the usefulness, technicality, cost advantage is suggested. For example, diverse methods are introduced in order to satisfy the individual need in the ordering method and payment method through Smart Ordering System and at the same time, the operating method should be designed.
conveniently. In addition, considering that the cost advantage has significant influence on the value perception and attitude formation, it is necessary to perform the service or promotion that can provide the monetary benefits only from relevant system. In case of “Siren Order” of Starbucks Korea, it provides the benefit in the aspect of cost to user through the issuance of BOGO coupon (1 + 1), the free beverage through the accumulation of Star, performance of specific event, etc. Second, since the enjoyment, which was proved in multiple researches, represented not to have significant influence on the perceived value and the attitude, it can be estimated that it would not be the major factor in the smart ordering system, of which purpose of use is simple and clear. Therefore, if the food service sector would introduce smart ordering system, it is necessary to establish the strategy considering the aspect of usefulness, technicality and cost advantage with priority than the elements related to the enjoyment. Third, it was confirmed that the more the perceived value and the attitude toward the technology are positive, the higher the user’s intention to accept the smart ordering system out of TBSS, through which the need to seek out the measures to induce the acceptance can be suggest by stimulating the aspect of user’s value and attitude.

The limitations of this study and the direction of follow-up research are as follows. First, to understand the non-face-to-face consumption culture at the point preparing post-Covid-19 era, the aspects of benefit and value received from new technology were examined from the smart ordering system, which is a kind of TBSS. However, the innovation of individual makes to take more active action in accepting new technology [14]. Therefore, it is regret that in this study, the innovative disposition possessed by the individual user was not considered, and in the follow-up research, the characteristics of the individual before contacting with new technology should be considered. Second, since this study was performed focusing on ‘Siren Order’ of Starbucks Korea, which is the Smart Ordering System introduced for the first time in the domestic food and beverage store, it is necessary to make effort to generalize the research results by performing the comparison with the system introduced by other brand or the integrated research.

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