

Information Provision Service Improvement Using Information Service Devices Through IPA - With Focus On Users Using Mainly Bus Information Provision Systems -

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ABSTRACT:- With the advanced development of information and communication technology (ICT), there is a growing number of devices that allow us to gain easy access to diverse information in our surrounding life spaces. In particular, the mobile provision of information, such as through portals, produces and distributes diverse tailored information services. While many people, however, have and use mobile devices, such devices are less likely to allow the utilization of information because among the mobile device users, there are those who do not use the Internet at all or who do not know how to use the Internet. In particular, many older people have mobile devices yet do not use its functions other than making a call. Thus, this study aimed to promote the use of information service devices that are easily accessible because they are situated in public places by presenting measures for improving the information provision method. In particular, to derive the information that the users of information provision devices want to have through the bus information system (BIS), which is the most easily accessible information system, improvement measures were derived using the easily accessible importance performance analysis (IPA).

KEYWORDS:- Information contents | IPA | BIS | content preference

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I. INTRODUCTION

Devices that provide diverse information are frequently seen in human spaces like bus stops, tourist resorts, restaurants, and department stores, where many people gather. These devices are installed to boost user convenience and to allow the users to use them more efficiently. In addition, efforts have been made to boost user convenience and efficiency, such as the provision of more information via mobile devices, leaflets, and the like. The promotion of these services helps boost competitiveness.

In particular, among the aforementioned information provision devices, the most accessible and frequently used is the bus information system (BIS). BIS provides not only bus information but also different other daily life information (weather, events, etc.), but more studies have yet to be conducted regarding the usefulness of the information that it provides as well as the users' satisfaction with the system, the level of importance of the system as perceived by its users, and how to use such system. As most studies have focused on a comparative analysis of information provision devices, the users' need for contents and the importance of the contents for the users have somewhat been neglected. If bus information provision devices or more information using these are provided, it will boost the BIS use rate and will reduce the people's boredom while waiting for buses, thus increasing the bus use rate. Also, bus stops will develop into shelters



Fig 1. Operating BIS (Anyang City).

Thus, this study aimed to use the importance performance analysis (IPA) methodology for an importance-satisfaction survey — widely used at present as a marketing technique — to determine the level of importance of the contents provided by BIS as perceived by its users, and to determine the users' satisfaction

with BIS, so as to derive improvement measures for the services. Towards these ends, Chapter 2 presents the IPA methodology. Chapter 3 derives and presents the IPA results and improvement measures. Chapter 3 presents the proposed improvement measures derived through the IPA of additional information provided in BIS, as well as the IPA of the use and recognition of the services and the improvement measures. Finally, Chapter 4 presents the comprehensive conclusions

To provide better-quality information using BIS, efforts should be made to provide the users with the contents that they really want, and to improve the services, an analysis of how the users think of the services should be carried out. In addition, efforts should be made to configure the services so that they would attract the attention of the users and would allow them to easily perceive the diverse information provided even for a short time, and to use the services easily. In addition, the additional contents that the users want can be similarly applied to different information provision devices, creating yet another standard of information provision.

II. DISCUSSION OF PREVIOUS STUDIES

1.1 Discussion of previous studies related to IPA

The IPA method is used mainly in marketing. To measure the users' thoughts about a company's services and products, it evaluates the level of importance attached to a product or service by its users by attribute as well as the level of the users' satisfaction with the product or service, and simultaneously carries out comparison and analysis. As such, it is an evaluation technique. IPA cross-evaluates the users' perception of the level of importance of a product or service as well as the level of their satisfaction with it, making it feasible to clearly derive problems and analyze the results.

Martilla and James (1977) first conceived of the IPA methodology. They carried out a survey of car purchasers based on the importance-satisfaction model to evaluate the service quality of companies. Based on the analysis data that they obtained, they explained that IPA could present efficient and rational standards for services.

Evans et al. (1985), through IPA, analyzed the tourist industry for the first time. They evaluated the tourist policies on the major tourist spots in the U.S.

Qu et al. (1996) carried out IPA of the competitiveness of the conventions held in Singapore and Hong Kong, deriving significant results.

Domestically, Kim Seong-il et al. (1991) evaluated the importance-satisfaction ratings of the users of Mt. Gaya National Park with regard to the park's facilities and services, and based on the results that they obtained, they presented proposed business strategies for Mt. Gaya National Park.

Park Beom-jin et al. (2011) carried out IPA involving importance-satisfaction analysis of the traffic information provided by VMS to present a content improvement plan.

As such, the IPA technique designed for reviewing the users' importance-satisfaction ratings for products and services has been widely used for the evaluation of services and for the managers' own evaluation. The technique makes it feasible to quantify the level of importance ascribed by the users of facilities/services to such facilities/services, and the level of their satisfaction with these, making it favorable to apply the results to real-world situations compared to one-dimensional questionnaire-based surveys. Thus, IPA is a good technique for deriving improvement measures for the information that BIS users can get in addition to bus arrival information.

1.2 Discussion of previous studies on the BIS field

Lee Won Gyu et al. (2008) identified the preference for bus information, predicted the demand for the use of such information, and presented the pay service measure for bus information provision. They surveyed the use of buses, derived the users' preference, and presented information use rate prediction methods based on the per-call payment system or the monthly fixed-fee system.

Kim Sun-ja et al. (2012) surveyed BIS services to examine the user satisfaction with them. To test the reliability of the results, they carried out principal component analysis of the exploratory factor analysis results, and adopted the Varimax rotation method to simplify the loading. In addition, to present the results of the confirmatory factor analysis, they derived a structural equation model, surveyed the improvement requirements based on the derived factors, and thus presented various service activation plans. Further, using the three hypotheses of usability, convenience, and availability, they explained that BIS would have positive effects on user satisfaction.

Park Han-yeong et al. (2012) carried out surveys to derive the level of user satisfaction with in-car devices, including BIS, and with three mobile media and their services. Also, they carried out categorical regress analysis to determine the relationship between user satisfaction with each media and their services. To derive service improvement plans, one-to-one interviews were carried out to gather the users' opinions.

III. METHODOLOGY

The IPA procedure is divided into four stages. Stage 1 involves preparing to clearly check the attributes and factors related to a particular service that are important to the users. The defined attributes are crucial for determining the usability of the analysis results, and as such, they should be closely examined using existing data or similar survey results. As there are insufficient previous studies, however, on BIS additional information, and insufficient similar surveys, this study examined the differences in BIS additional-information provision among the target areas (Sejong, Daejeon, and Cheongju) to derive questionnaire items.

Stage 2 involves distributing the formulated questionnaire to the respondents for the latter to give an importance-satisfaction grade for each item based on a scale of 1 to 5 or 7 points. This study used a 5-point Likert scale for quantifying the level of importance of the questionnaire items so as to determine their importance order. Stage 3 involves the creation of an action grid (analysis diagram), which plots importance vertically and satisfaction horizontally, to obtain the mean and median values of each attribute, and accordingly to mark each attribute position on the action grid. Martilla and James (1977) analyzed the evaluation value of each attribute in terms of the mean value of the survey questionnaire items, but other researchers pointed out that the method employed by Martilla and James did not involve an interval scale and thus proposed a median value. Crompton et al. (1984) presented a method by which the respondents were to directly mark the quadrant positions, and analyzed the mean value of importance-satisfaction. The last stage, stage 4, involves analysis for using the results shown on the quadrant of the action grid to evaluate the strengths and weaknesses of certain attributes according to the four standards of the IPA analysis diagram, as shown in Fig 2

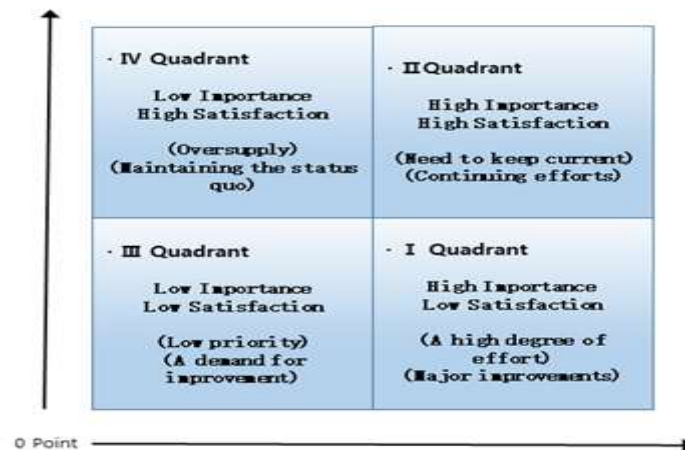


Fig 2. IPA diagram.

Quadrant I, which shows important improvement, offers factors that the users deem very important while showing low user satisfaction. Thus, efforts for improvement need to be made in terms of service provision. Quadrant II shows that the users deem the item important and highly evaluate their satisfaction with it. This suggests that efforts should be made to continue to maintain the current user satisfaction with the services. Quadrant III shows that the users do not deem the item important, and also show low user satisfaction. Here, low user satisfaction is indicated, but the priority for improvement is lower. Quadrant IV shows that the users deem the importance to be low while their satisfaction is high. This suggests that efforts should be made to maintain the status quo, but if the capabilities are concentrated on other higher-importance services, this item may be less prioritized.

To select the target survey areas, a survey was carried out about the recognition of the BIS contents. Also, a pre-survey was carried out to select the operation method preference and the content items.

Each item position was determined then was positioned on the IPA diagram to determine Quadrant I (continuing important things) for high importance and high satisfaction, and Quadrant II (continuing efforts).

IV. RESULTS OF THE BIS INFORMATION PROVISION IPA AND IMPROVEMENT MEASURES

1. Results of the Pre-Survey

To carry out IPA of the areas where the bus users had a high level of recognition of the contents, a pre-survey was carried out. Three target areas, including the adjoining cities (Cheongju, which includes Cheongwon-gun, implements BIS services at one ITS center), were selected as the areas where the survey was to be carried out. A total of 503 respondents were surveyed for analysis purposes, as shown in Table 1.

In addition, the method of providing BIS bus information and contents, the screen display method, and the operation method employed by the three municipalities are different, as shown in Table 2.

Table 1. BIS use rate and content recognition survey results

Category	Item	Sejong City		Daejeon City		Cheongju City (including Cheongwon)	
		People	%	People	%	People	%
Whether to use BIS	Use	165	69.6	104	86.7%	161	90.4
	Do not use	72	30.4	16	13.3	17	9.6
Recognition of BIS contents	Know	50	23.5	26	22.8	79	44.9
	Do not know	115	54.0	67	58.8	60	34.1
	Not interested	48	22.5	21	18.4	37	21.0

Table 2. Overview of BIS content provision by local government

Category	Sejong City	Daejeon City	Cheongju City (including Cheongwon)
Screen ratio of contents	35% of the screen display	40% of the screen display	60% of the screen display
Display of content menu	Not displayed	Not displayed	Displayed
Operation method	Keypad	Keypad	Touch screen
Types of provided contents	Route information, news, municipal administration information, bus stop search	Route information, news, municipal information, vehicle allocation information, transfer information	Weather forecast, other daily life information, route information, municipal administration information, intercity and express bus information, Osong Station KTX information, Cheongju Airport operation information, performance and exhibition cultural information, tourist and historic site information, etc.

The survey of BIS content recognition information revealed that the content recognition rate of Cheongju (including Cheongwon) was high as the BIS allocated more screen space for the provision of contents than for bus information, provided diverse information, and offered an easier operation method (by touch screen). The visibly recognizable information provision, easy access, and the type of information provided influenced the users' recognition of the contents. In addition, Cheongju (including Cheongwon), with a high content recognition rate, was selected as the survey point for content importance-satisfaction, and 220 people were additionally surveyed

2. BIS Content Service Access and IPA of Provision Methods

2.1 IPA results

To explore improvement measures for the content provision method, this study surveyed the users' importance perception and satisfaction level with the contents' screen occupation ratio and composition, standard display or non-display of the content menu, and operation method, and accordingly, the IPA diagram showed the same analysis results as those in Figure 3 and Table 3

Table 3. Survey of operation methods for greater content access

Category	Importance degree	Satisfaction degree
Contents' screen display ratio	2.58	3.19
Display of the content menu	2.47	3.45
Composition of the content screen (display method)	4.05	3.31
Operation method for accessing contents	3.40	3.26

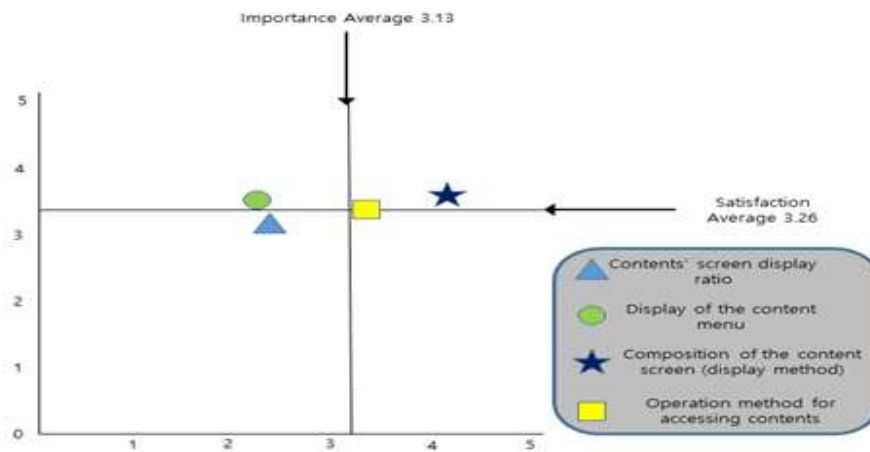


Fig 3. IPA diagram of content provision methods

The established standard BIS components were surveyed so that the survey items would not be diverse and only the components deemed important by the users would be analyzed. In particular, it was confirmed that it is important to display contents so that while checking the bus information, the BIS users would be able to simultaneously and easily check other contents. This requirement got the highest importance score of 4.06 points in the IPA, and 3.31 points for satisfaction, higher than the average (3.26 points). In addition, with regard to the BIS services offered by Cheongju (including Cheongwon), the users assessed the importance of the operation method for accessing other additional contents at 3.40 points, and their satisfaction with such method at 3.26 points. These figures were deemed average. In particular, unlike other municipalities, Cheongju provided the touch screen method, resulting in an average user satisfaction level. To further confirm this result, a preference survey for the keypad and touch screen methods was additionally conducted. The survey values that were obtained are shown in Table 4.

Table 4. Survey of operation methods for greater content access

Category	Pair of keypads		Direct touch screen	
	People	%	People	%
Survey results	31	14.1	189	85.9

The users preferred the direct touch screen method when accessing additional contents. This suggests that they prefer the intuitive method, which boosts convenience and allows intuitive content selection. The users were found to prefer the existing easily accessible methods, such as with smartphones and other installed information provision devices.

Meanwhile, the users assessed the importance of the content display ratio on the BIS screen as 2.58 points, and their satisfaction with it as 3.19 points. The importance of displaying the content menu as a standard was assessed as 2.47 points, and the user satisfaction with it was assessed as 3.45 points, indicating greater satisfaction than importance, and thus leading to the positioning of the analysis results on Quadrant IV.

2.2 Improvement measures

The screen composition for content provision was determined to be the most important in the analysis. This suggests that when the users are provided with bus information, they should be able to simultaneously check and acquire the information at a glance, which seemed to be regarded as important by the users. BIS should continue to provide bus information, and thus, the content and information provision composition, the display method, and the access should be thoroughly examined. With this expectation, the preference for content access, as in Table 5, was surveyed.

Table 5. Survey of preference for content access methods

Category	People	%
Additional information to confirm without operation	169	76.8
Detailed information although operation is required	51	23.2

The preference survey for access methods revealed that 76.8% of the users prefer additional information not requiring operation. As shown in Table 5, the users prefer higher convenience, and the corresponding service improvement measures are thus required.

3. BIS Content Service IPA Results

3.1 IPA results

To derive improvement measures for content provision, IPA was carried out to survey the users' importance perceptions and satisfaction levels,. The IPA diagram shown in Fig 4 was thus derived.

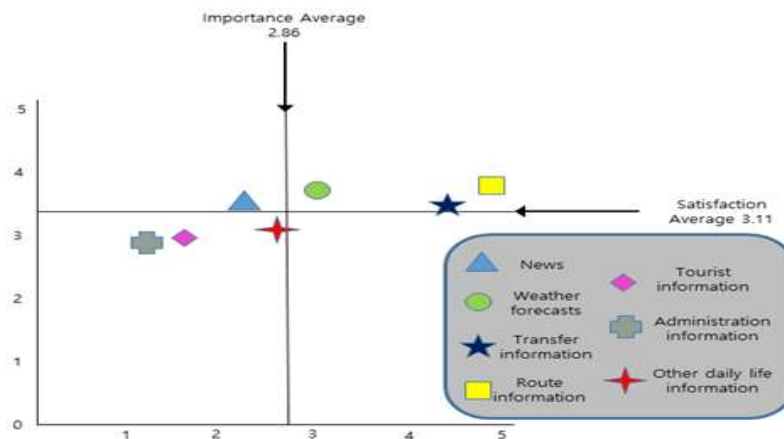


Fig 4. IPA diagram of content services.

Table 6. Survey of operation methods for greater content access

Category	Importance degree	Satisfaction degree
News	2.32	3.24
Weather forecasts	2.93	3.33
Transfer information	4.17	3.25
Route information	4.60	3.45
Other daily life information	2.79	2.80
Tourist information	1.83	2.89
Administration information	1.36	2.83

IPA was carried out on the provided content service, revealing the average importance score of 2.86 points and the average satisfaction score of 3.26 points. In particular, the importance levels of route and transfer information were assessed as 4.60 and 4.17 points, respectively, both over 4 points, suggesting that such information types were recognized as very important contents by the users. The survey results on the use of service provision devices were found to serve the purpose of BIS. In addition, the satisfaction value was lower than the importance value, but upwards above the average. The interview survey revealed that a number of users indicated the inconvenience of having to carry out an additional operation for accessing the contents, and did not know how to carry out such operation due to the lack of publicity about route search.

The importance of news, daily life information, tourist information, and administration information was found to be low.

3.2 Improvement measures

In the case of the contents, given the devices installed for bus users, the perceived importance of additional contents or contents other than the bus information was found to be high. This suggests that additional information should be provided, and this influences the use of buses. Additional input is required, however, for searching the transfer information, which is deemed somewhat difficult. Yet, the measures for displaying the information for the convenience of the passengers moving to major transfer points should be closely examined, and the services should be improved in such a way that the information would be provided

through route information rotation so that the users could be easily provided with contents. Moreover, in the case of news, with high satisfaction compared to perceived importance, the one-line display improvement measure should be worked out to boost user convenience.

In addition, regarding other daily life information and tourism and administration information, the perceived importance was lower, indicating that the major bus users are mostly residents of Cheongju (including Cheongwon). Thus, measures need to be worked out to provide information by purpose, to provide contents to the main target users, and to easily provide such contents.

V. CONCLUSION

The bus information system (BIS) is operated nationwide, providing information about the bus transport system in the country. For over 15 years, significant developments have been made in BIS. Diverse contents, other than the bus arrival time, are now provided, but more studies have yet to be carried out regarding content provision. Thus, to derive BIS content improvement measures, importance performance analysis (IPA) was carried out regarding perceived importance-satisfaction. As a result, in providing contents via BIS, easy acquisition of information and screen composition were found to be perceived by the users as very important. It is but natural that devices that are inconvenient to use are not significantly used. In addition, regarding the provided contents, the information on bus transfers and routes, which serves the purpose of using BIS, was found to be perceived by the BIS users as very important, suggesting that the devices must provide the information that serves the purpose of their installation. Access improvement measures, however, should be additionally examined as no matter how good the information provided by BIS is, the system will be less used and less satisfying if the users find it inconvenient to use or do not know how to use it.

Despite having presented improvement measures, this study has limitations. One is that the devices are operated by municipalities on their own, which makes it difficult to directly operate and test these. Through IPA, the perceived importance-satisfaction was analyzed, but it is not certain how accurate the results will be in real-life situations. In addition, short-term effects cannot be expected, and the contents to be provided should be publicized and promoted among the general public.

The IPA results showed, however, that the users believe that it is important for them to be easily provided with the information that they need and that will serve the purposes of the installation of the devices. Thus, if diverse contents that serve the purposes of the devices are provided in addition to the information limited to BIS, even if the devices are inconvenient to use, it can be expected that more people will use them

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