



A Study on the Customer-based Pricing Approach for Railway Fare of Express Train*

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Abstract

Purpose – Among the various pricing approaches used to set fares for express trains, this study explores a method of utilizing a customer-based pricing approach. The purpose of this study is to figure out how to apply the customer-based pricing approach to fares of new railway services using express trains.

Research design, data, and methodology – This study was conducted through a literature review and case studies. In the literature review, we examined three approaches, focusing on the customer-based pricing approach and its application. In the case studies, we show how a customer-based pricing approach can be applied to determining the fares for railway services.

Result – Some studies have used a customer-based pricing approach to set railway service rates, adapting the concepts of customer-based pricing such as demand, elasticity, value and willingness to pay. When setting fares of new railway services, it is recommended to use the customer-based approach in conjunction with other pricing approaches.

Conclusion – This study demonstrates that a customer-based pricing approach is a promising tool in making decisions on railway fares. By applying a customer-based pricing approach to fares for new railway services using express trains, railway operators can utilize new service rates and increase the profitability of the railway business.

Keywords: Railway Service, Express Train, Customer-based Pricing, Demand, Willingness to Pay

JEL Classification Code: L91, M31.

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1. Introduction

Korea is grappling with the problems of traffic congestion and increased travel time in the metropolitan area due to population concentration and the spatial broadening of metropolitanization. Examples such as New York, London, and Paris show that even in the case of countries with large metropolitan areas, many problems can be solved by raising the share of rail transport. This is because the utilization of well-designed railroads can reduce travel time, and improve punctuality, which results in the low ratio of road traffic, less traffic congestion and environmental pollution.

The 4th National Rail Network Construction Plan, applicable from 2021 to 2030, shifts the focus of traffic policy from roads to railroads, and contains plans for an overall expansion of the national rail network. A key component of this plan is the expansion of the metropolitan area rail network and the addition of a new GTX (Great Train eXpress) in the metropolitan area with the aim of mitigating the transportation problem in the metropolitan area. The expansion of the metropolitan area rail network can quantitatively increase rail usage, and the establishment of the metropolitan area express rail, which will dramatically accelerate movement, is expected to have a wide range of beneficial effects such as adding a single rail line.

The metropolitan express railway, which has recently received much attention, can greatly contribute to solving the transportation problem in the metropolitan area by drastically enhancing the scheduled speed. However, it will be difficult for the four GTX lines that are currently planned to cover the entire metropolitan area, which has spatially expanded, and it will be challenging to secure the immense budget and time required to continuously establish new GTX lines. Therefore, it will be necessary to continue efforts to speed up scheduled time by using the existing infrastructure of metropolitan railways and other urban railways in the metropolitan area.

Measures to convert existing metropolitan and urban railways into express lines have already been implemented on the Gyeongbu line and Gyeongin line. In addition, some researches continue to develop new technologies. For example, new technologies on express train allow non-express lines to be converted for express travel by recycling the existing rail infrastructure. Both the new metropolitan Great Train eXpress (GTX) service and the express services from the conversion of rail lines are considered as new rail services. In this context, there is a need to review what type of rail fare will be applied to these express services. Implementing a new rail fare has a significant impact not only on rail service users but also on operators: it has a direct relationship with customers in terms of cost burden as well as with railroad operators in terms of revenue generation.

The price of rail services, so-called fares or fees, has been hitherto based on either cost or public utility, as in the case of decision-making on other transportation or public service fees. In general, it is desirable to determine the price of goods or services by considering the factors of cost, competition, and demand in a comprehensive way. The demand factor involves considering the customer's point of view in making pricing decisions. Installing express lines in metropolitan railways and developing the metropolitan GTX will provide new services to consumers. As such, it will be necessary to consider the customer's point of view in determining fares.

Although there have been a few studies that apply customer-based approaches to decision-making on railway fares, most of these studies are limited to a narrow field. Furthermore, previous efforts to apply customer-based pricing policies into railway fares have been mostly inappropriate. This study aims to examine the customer-based pricing approach in railway fare using express train, including its theoretical basis and specific case-application. Exploring a method of utilizing a customer-based pricing approach, we show how to apply the customer-based pricing approach to setting fares for new railway services using express trains. A major contribution of this study is to demonstrate that a customer-based pricing approach can be useful when making decisions on railway service rates. In addition, we discuss that the customer-based approach needs to be used in conjunction with other pricing approaches, such as cost-based and competition-based approaches. A practical contribution is to provide policy makers and railway operators with insights on the possibility of using a customer-based approach in determining fares for future metropolitan railway services such as GTX line and express trains of current lines.

2. Literature Review

2.1. Express Train

Express trains are trains that can shorten the travel time of train users by increasing the scheduled speed. The operation of express trains can be broadly classified into two methods. One is to increase the scheduled speed by stopping only at major stations rather than stopping at all stations on the fixed rail line. The express trains currently operated on the Gyeongbu line and Gyeongin line fall into this category. The other method is to increase the scheduled speed by operating direct trains that stop only at the departure and arrival stations. Examples of this is the non-stop

train that runs between Seoul Station and Incheon International Airport Station, currently operated by the Airport Railroad Co., Ltd.

The 4th National Rail Network Construction Plan announced in 2021 has a plan to add a new GTX in the metropolitan area. GTX represents an attempt to solve the transportation problem in the metropolitan area through the quantitative expansion of railroad usage and acceleration of speed. GTX refers to a railway that is not limited to one city or province and that connects two or more urban points to handle daily transportation demand, designed to provide an efficient transportation network system with high-speed service (100km/h or more) in accordance with the national strategy (Wee, Kim, Park, & Park, 2010). GTX is a project to newly construct lines for express trains.

Meanwhile, there is also the method of using existing urban or broad-metropolitan railway lines to run express trains. There have been many studies on methods of operating express trains using the existing railroad infrastructure. Both the method using quadruple tracks and the method of using sidetracks have been mainly discussed as the methods of operating express trains using the existing railroad infrastructure. (Lee, Lee, Kim, & Lee, 2018). The method using quadruple tracks means installing one additional track next to existing ones to operate express trains. This is the method applied to express trains currently adopted on the Gyeongin line. The method using the sidetrack is a method in which one sidetrack is installed at an average interval of every four stations to enable express trains to pass without stopping while non-express trains wait on the sidetrack until they can proceed after the express trains. This is the method applied to express trains currently operated on Seoul Subway Line 9.

There has been a study proposing a plan for rail acceleration using sidetracks, simultaneously taking account of plans for the new construction of GTX and the conversion of existing railways to express service (Kim & Woo, 2017). This study reviewed the three GTX route sections scheduled to be newly established and proposed installing sidetracks on the Gyeongbu line and Gwacheon line, which have relatively high cost-effectiveness. Our study focuses on the determination of fares for either GTX or express trains using existing railroads.

2.2. Price Management

The process of price management can be divided into the stages of setting the price, adapting the price, and changing the price. Setting the price is the starting point for price management, and the price setting process can be sub-divided into five steps (Kotler & Keller, 2016). The first step is to clarify the objectives of the process of price decision-making. Some of the possible objectives for price setting include the survival of a company, maximizing current profits, maximizing market share, maximizing initial profits, and achieving leadership in product-quality. The second step is to determine demand. To determine the price, it is necessary to have the ability to estimate the demand curve of the company's goods and services to some extent. In the demand curve, the relationship between price and demand is usually inversely proportional: the higher the price, the lower the demand. The third step is to estimate the cost. Whereas demand is a determinant of the maximum level of the product price set by the firm, cost is related to the minimum level of the product price. This is because profit is realized only when the price level of a product is higher than the average cost per unit of the product. The fourth step is to analyze competitor firms. Consumers make decisions by comparing one company's products with those of competitors. To determine the price level that would make it possible for a product to be chosen by the consumer, the price levels of competitors must be considered. The final and fifth step is to choose a pricing method. To determine the price of a good or service, there are basically three factors to consider: the cost, the demand, and the competition. The final price level should be determined by considering these three factors.

Companies usually do not set and implement a single price, but rather, adapt the price differently by taking account of various circumstances (Kim, Kim, Kim, Kim, Kim, & Han, 2017). While the price setting decision discussed above determines the price of individual products, adjusting the price means the development of a price system structure that takes into account various situations. The means of adjusting the price can be divided into discounts and allowances, promotional pricing, price discrimination, and other types. Most companies adjust the list price to offer discounts and allowances for early payment, bulk purchases, and off-season purchases. These discounts and allowances can be divided into those offered to consumers and those targeting middlemen. Promotional pricing can be used to encourage consumers to purchase early. The discounts and allowance discussed above can also be used for the purpose of adjusting promotional pricing, examples of which include special event pricing such as a new semester sale and special customer pricing that provides a special price to specific customers only. Price discrimination is the application of different prices for the same product or service depending on the target customer, point of sale, location, and transaction conditions.

Changing the price means a price cut or a price increase (Lee, Lim, & Park, 2019). Unlike adjusting the price, which means a temporary price change under specific conditions, changing the price characterized by continuity, since the new price is maintained for a relatively long time. Practices related to changing the price include price cuts, price

increases, and responses to a competitor's price changes. A company can cut prices to maintain its sales volume and market share when the market is highly competitive. The price change can be applied relatively quickly to a product and can induce a direct response from consumers. When a company raises its price, it is often because of a cost increase factor. When the price of raw materials or parts required for a product increases, the price of the product is also affected, and when the existing price level can no longer be maintained, a price increase is implemented. If a competitor implements a price increase or a price cut first, it is necessary to respond in terms of price. If a competitor cuts its price in a homogeneous product market, it is necessary to respond by matching that price level. On the other hand, there is no need to respond to a competitor's price increase, and the company that raised its price will likely also withdraw the price increase.

2.3. Pricing Approach

There are several approaches to use when determining pricing. Nagle and Hogan (2005) divided pricing approaches into a cost-based approach, a customer-based approach, and a competition-based approach, and divided the customer-based pricing approach into two sub-categories. Kotler and Keller (2016) also analyzed the five steps of price determination and identified the step of analyzing the factors of demand, cost, and competition. The method of price setting can be divided into cost-based pricing, competition-based pricing, and demand-oriented pricing. The demand-oriented pricing is a customer-centric approach that prioritizes consideration of customers' responses to prices (Lee et al., 2019). In general, in order to determine the price of a good or service, three factors must be considered: the cost factor, the demand or customer factor, and the competition factor.

In managing the level of pricing, a model that considers the factors of costs, customers, and competition can be utilized (Kotler & Keller, 2016). Studies have found that the cost of the product forms the minimum price level while product features and customer evaluations form the maximum price level, and that the price of competitors is positioned at the middle price range. As shown in Table 1, the option of setting the product price too low cannot be selected because there is no profit potential, while setting the product price too high is not a feasible selection either because this will not be acceptable to consumers. The floor price is related to the cost of the product and indicates that the price must be higher than the cost to generate profit. The ceiling price is related to the value of the product as evaluated by consumers and means that a purchase occurs only when the price is set lower than the value attributed by the consumer. Finally, the prices of competitors and the prices of substitutes often exists between the floor price and the ceiling price and these often function as starting points for decision-making on the level of the price. Table 1 shows that the price setting model includes three pricing approaches, namely the cost-based, competition-based, and customer-based approaches.

Table 1: Three major considerations for price setting

Three major considerations		Price line from the considerations	
Considerations	Roles	Price lines	Remarks
Customer's assessment of unique product features	Establishing the price ceiling	Ceiling price	No possible demand over this price(at high price)
Competitors' prices and prices of substitutes	Providing a orienting point	Orienting point	-
Costs	Setting a floor to the price Setting	Floor price	No possible profit under this price(at low price)

Several approaches can be used to determine pricing for public utilities as well, including the three approaches respectively reflecting the cost, customers, and competitors, as discussed above. The cost-based approach is called the "cost of service principle," the customer-based approach is called the "value of service principle," and the competition-based approach is called the "competitive price principle" (Koh & Kim, 2015). Public utility fees refers to the user prices for public goods and services. Public utility fees are prices determined by the government, in the form of authorizations and approvals, for goods and services produced and supplied by public companies because of their strong public necessity and their large impact on the national economy. The cost of service principle, value of service principle and competitive price principle are also applicable as the main principles for determining the level of public utility fee rates. First, the cost of service principle is a method of determining the fee based on the cost required for the production or supply of goods or services. Since "cost" is a polysemous concept that can be interpreted in various ways, it is necessary to accurately analyze costs when applying this principle. In general, for regulatory purposes

"cost" refers to the economic cost, including a reasonable rate of return for capital investment. Next, the value of service principle is a method of setting the fee price to correspond to the value perceived by the consumer, regardless of the cost of the service provided. This method is used as the basis for the differential rate system based on the price elasticity of consumers. In addition, the service value establishes the upper limit in determining the public utility fee rate, as the users will not pay a price that exceeds the level generally perceived to be the value of the service. The competitive price principle assumes a competitive environment and is a method in which the market mechanism determines prices based on hypothetical competitive prices. In the case of public utility companies, it is not easy to apply this competitive price principle because such companies tend to have monopolies and thus it is difficult to establish a competitive environment. Basically, public utility rates are often determined based on the cost of service principle.

2.4. Customer-based Pricing

There are three pricing concepts that are relevant to customer-based pricing: these are the reference price, the reservation price, and the lowest acceptable price. The reference price is the price that consumers use as a basis for evaluating the price level of a product (Yoo, Simon, & Fassnacht, 2021). The concept of a reference price is critically important in price management because consumers judge whether the price of a product is high or low based on their reference price, and their likelihood of purchasing will change accordingly. The reservation price is the maximum price a consumer is willing to pay for a particular product (Simon & Fassnacht, 2018). Consumers make purchases when the price of a product is below the reservation price, but hold back from purchasing when the price exceeds the reservation price. Therefore, the reservation price is also called the maximum acceptable price. The reservation price is a very important concept in regard to profitable pricing, which price management should aim to achieve, because the reservation price serves as the upper limit of sellable pricing. The lowest acceptable price is the lowest price at which consumers do not question or doubt the quality of the product (Lee et al., 2019). Consumers do not continue to respond positively as the product price goes down: when the product price falls below a certain level, they doubt the quality of the product. Accordingly, the lowest acceptable price is the price level at which consumers are at the threshold of beginning to doubt the quality of the product. In other words, the lowest acceptable price is the lowest level to which the price can be lowered without the consumer doubting the quality of the product; once the product's price falls below this level, consumers begin to suspect its quality.

We have found that when considering the factors of cost, customers, and competition in price level management, the cost of the product forms the minimum price level, the product features and customer evaluation form the maximum price level, and the prices of competitors is positioned at the middle range of prices. Price management from the customer's point of view, using a customer-based approach, applies the concepts of reservation price, reference price, and lowest acceptable price as reference points (Park, 2011). Table 2 explains the concepts of reservation price, reference price, and lowest acceptable price through comparisons to consumers' perceptions, to help understand price level management from the customer's point of view.

Table 2: Three price types for customer-based pricing

Types of Price	Roles	Remarks
Reservation price	the highest price that a consumer is willing to pay	the purchase is reserved because it is too expensive over this price level
Reference price	the price that consumers use as a standard when evaluating the price	-
Lowest acceptable price	the minimum price at which consumers do not doubt the quality	the quality is suspected because it is too cheap under this price level

In Table 2, if the price of a product is higher than the consumers' reservation price, consumers perceive it to be expensive and will hold back from purchasing. On the other hand, if it is lower than the lowest acceptable price, the price will be perceived as cheap but consumers will not make a purchase because of their suspicions about quality. Ultimately, the range of pricing that can induce consumers to make a purchase is between the lowest acceptable price and the reservation price. If the price of the product is higher than the reference price, it is perceived to be somewhat expensive, and if it is lower than the reference price, the product is highly likely to be perceived as somewhat cheap and purchased.

Meanwhile, the price concepts used in customer-based pricing is related to the values perceived by the customer. Therefore, measuring the value perceived by customers is very important in a customer-based pricing approach. Perceived-value pricing, one of the methods of determining price, refers to the method of setting the price based on the value perceived by the customer (Kim et al., 2017; Lee et al., 2019). Products provide benefits to consumers, and consumers assign subjective values to those benefits. If a consumer evaluates the benefit and value of a product highly, it will be possible to induce that consumer to purchase the product even if a high price is set, regardless of the cost. However, if consumers perceive the value of the product to be low, they can be induced to buy only by offering a lower price. If this lowered price is lower than the cost, a situation will arise in which the product must be sold at a loss.

The value of a specific product or service perceived by consumers is very important in determining the price. If the perceived-value is very high among consumers, the product is sold at a price that is much higher than the cost of the product, which will result in larger sales and profits. Many luxury goods are sold despite their very high prices because many consumers believe it is worth more than that price. However, when consumers' perceived-value level is low, companies may face challenges. If the price is set based on the cost of a product, without considering its perceived-value for the customer, and this presented price turns out to be higher than the perceived-value of the product, it will be difficult to sell the product in the market. And in this case, if the price is set lower than the perceived-value among consumers in order to increase the sales volume, the sales volume may increase, but the per unit and total profit may decline. Therefore, the perceived-value of customers plays a very important role in price determination along with the factors of cost and competitors.

3. Case Study

3.1. Methods of Customer-based Pricing

Understanding customer demand is a basic requirement in the process of pricing setting. Several methods are available for estimating the demand curve (Kotler & Keller, 2016). In the case of existing goods and services, historical data on demand by price can be analyzed. If there is no historical data, data can be collected and analyzed using tests or survey methods. In a test situation, one can record and analyze how demand changes according to a changes in price, or ask prospective customers whether or not they would purchase a product after presenting them with various prices. Price elasticity of demand is a measure of how sensitive (elastic) demand is to changes in price, and refers to the rate of change of demand with respect to the rate of change in price. When the price elasticity of demand is greater, the demand can be increased to a greater extent by a low-price policy. However, it should be noted in regard to elasticity at a specific price that the elasticity may vary depending on whether the price is increased or decreased; lowering prices may not increase demand significantly, but raising prices may reduce demand significantly.

Also, there may be various methods used to specifically measure the value perceived by the customer. Customer perceived value is used as a major variable in many studies (Samadou & Kim, 2018; Lee & Park, 2021). There are also studies dealing with price and consumer perception (Yoon, Kim, & Park., 2011; Kim & Choi, 2012). One of the methods of measuring a customer's perceived value is to have the customer evaluate the attributes of various alternatives and measure the relative value of each alternative (Busch & Machael, 1985). Table 3 provides an example illustrating this method of measuring the perceived values of customers.

As shown in Table 3, customers evaluate four options (A, B, C, D) for each major attribute (e.g., quality, performance, convenience, reliability). At this time, for the evaluation score of each option, a total of 100 points are allocated across the four options. In Table 3, for the attribute of "quality," the customers who responded evaluated the four options by assigning 30 points for A, 15 points for B, 35 points for C, and 20 points for D. Meanwhile, customers may place varying degrees of importance on each key attribute when evaluating a product or service. In Table 3, the relative importance of an attribute is expressed as its proportion out of a total of 1 point. The attribute of "quality" has the highest importance at 0.45, which is 45% of the total possible score, and "reliability" was given the lowest relative importance at 0.10. Respondents assigned 30 points to both the "quality" and "reliability" attributes for option A, but the actual evaluation value of each attribute considering its relative importance is $30 \times 0.45 = 13.5$ for "quality" and $30 \times 0.10 = 3$ for "reliability," thus exhibiting a large difference. The evaluation scores that customers gave to each option on the main attributes then processed to reflect the relative importance of each attribute and thus the final evaluation score for each option is calculated. In Table 3, the final evaluation score for the four options was calculated as 26.5 for A, 18.25 for B, 32.25 for C, and 23 for D. When determining the price level of products or services, the company that owns option A will be able to determine an appropriate price level by considering the price level of its

competitors and the evaluation received by option A compared to the evaluations earned by the options from competitors.

Table 3: Evaluation of Perceived Value

Attributes	Importance	Alternatives				Total
		A	B	C	D	
Quality	0.45	30	15	35	20	100
Performance	0.20	25	25	25	25	100
Convenience	0.25	20	20	30	30	100
Reliability	0.10	30	15	40	15	100
Total	1.00	26.50	18.25	32.25	23	100

Also, for price setting based on the customer's perceived value, one can also use the method of measurement based on a comparison with a reference product. The process of measuring perceived value through a comparison with a reference product and price setting is largely comprised of three steps (Forbis & Mehta, 1981). The first step is to select a reference product that consumers use as their reference to compare the company's own product. A reference product is usually likely to be a product already used by the customer or a product of a major competitor. The second step is to calculate, in monetary terms, the increase in benefit the customer would gain from using the company's product instead of the reference product. The key task here is converting the additional benefits into economic values. The third step is to determine the appropriate price level by taking account of the price of the reference product and the additional economic value provided by the company's own product. The company may determine the maximum price by adding all of the additional economic benefits provided by its product to the price of the reference product, but in reality pricing is often set at an intermediate level between the price of the reference product and the maximum feasible price.

3.2. Application of Customer-based Pricing

Compared to other industries, the railway industry has hitherto not appropriately adapted apply the customer-based pricing approach. However, several studies have attempted to apply a customer-based pricing approach to rail fares.

First, there was a study that calculated the amount of change in demand as a result of changes in the fare of the metropolitan railway, focusing on willingness to pay and the fare elasticity in the case of the metropolitan railway (Song, Kim, Lee, & Kim, 2017). In this study, the level at which customers were not willing to pay was investigated by increasing the rate in increments of 100 won from the standard rate of 1,100 won. Through this process, the correlation between fare changes and the demand change rate was calculated to determine fare elasticity as shown in Table 4. Table 4 demonstrates that the price elasticity of demand is between -1.3 and -0.8 from 1,100 won to 2,200 won, which indicates relatively strong in elasticity. Since examining the price elasticity of demand is the most significant component of a customer-based pricing approach, it needs to be adopted as basic analysis technique in the future.

Table 4: Elasticity of Metropolitan Train Fare

Fare(Won)	Change of (%)		Elasticity
	Fare	Demand	
1,200	9.1%	-9.7%	-1.070
1,300	18.2%	-19.0%	-1.042
1,400	27.3%	-28.9%	-1.061
1,500	36.4%	-32.4%	-0.892
1,600	45.5%	-56.4%	-1.240
1,700	54.5%	-57.9%	-1.061
1,800	63.6%	-61.3%	-0.964
1,900	72.7%	-65.3%	-0.898
2,000	81.8%	-66.8%	-0.817

2,100	90.9%	-82.5%	-0.908
2,200	100.0%	-84.3%	-0.843
2,300	109.1%	-85.8%	-0.786
2,400	118.2%	-87.5%	-0.741
2,500	127.3%	-88.5%	-0.696
2,600	136.4%	-92.0%	-0.675
2,700	145.5%	-92.3%	-0.634
2,800	154.5%	-92.3%	-0.597
2,900	163.6%	-92.8%	-0.567
3,000	172.7%	-92.8%	-0.537

In other study on the optimal fare for train providing direct express access to the airport, fare analysis was performed by taking account of the time value for customers (Lee, Cho, Kang, & Lee, 2013). Table 5 shows, first, the price calculated to reflect the time-saving value of direct express trains compared to general trains and the price calculated to reflect the time-saving value of direct express trains compared to airport buses. When comparing the express train to the airport bus in terms of the time value, the analysis distinguished between total time expended and the total time spent on board. In general, among the values provided by express trains, the time saving value is the one most mentioned; therefore, the approach used in the above study ought to be adopted widely in future studies. The study also utilized various methods that can be considered a customer-based based approach. A customer survey was conducted on direct express trains, general trains, and airport limousine buses to identify key factors that determine customers' choices. As a result of a conjoint analysis, the study found that the key factors for selecting which means of transportation to purchase were fare, required time, transfer requirements, and additional services, in that order. In addition, this study forecasted that when the prices of other modes of transportation are fixed, the demand for direct express trains would vary with price fluctuations.

Table 5: Simulation Results of Express Train Fare

Classification	Means of Transportation			Remark
	Airport Bus	All Stop Train	Express Train	
Current Fare	12,500	3,950	13,800	
Case 1	3,950	-	5,382	Time saving
Case 2	-	12,500	12,115	Total travel time
Case 3		12,500	16,095	Pure riding time

In another study, a survey was conducted on customers who currently use the metropolitan railroad to identify the higher fare levels that they would willing to pay (Kim, Ahn, & Ahn, 2016). This study investigated the maximum amount that customers could pay additionally, assuming that travel time can be shortened by increasing the speed of the metropolitan railway. The purpose of this study was to find out how much additional fare charges customers could pay if the travel time of the current metropolitan railroad was reduced by 10%, 30%, and 50%, respectively. As shown in Table 6, it was found that customers would be willing to pay an average of 155.2 won more if travel time was reduced by 10%. When travel time is reduced by 30%, customers would be willing to pay an average of 318.1 won more, and when travel time is reduced by 50%, they would pay an average of 516.7 won more. Furthermore, this study found that the amount of the additional fare one is willing to pay was larger when the purpose of travel was business than when the purpose of travel was not business related, and that this amount one is willing to pay was also larger when the on-board time spent on the line one normally rode was longer. These survey results provide many insights that will be useful for determining the level of fares for new railway services such as GTX lines and express trains of current line.

Table 6: Additional willingness to pay

Classification	Amount of additional willingness to pay more					Average amount of additional willingness to pay
	under 100 (Won)	100~200 (Won)	200~500 (Won)	500~1,000 (Won)	over 1,000 (Won)	
10% time saving	45.7%	33.0%	11.6%	5.4%	4.3%	155.2 Won
30% time saving	23.1%	22.3%	36.1%	10.4%	8.1%	318.1 Won
50% time saving	12.7%	13.9%	31.6%	25.4%	16.3%	516.7 Won

4. Conclusions

Among the various pricing methods used to set fares of express railroads, this study examined the use of the customer-based pricing approach. For this purpose, we reviewed three approaches to price setting and focused on implementing the customer-based pricing approach. In addition, by examining preceding studies on a customer-based approach to setting fare rates of rail services, we analyzed how this approach can be used to set service rates for new express train lines, including GTX lines, in the future. A major contribution of this study is to demonstrate that the customer-based approach can be actively used in conjunction with other pricing approaches, such as cost-based and competition-based approaches and that it can be useful in making decisions on railway service rates.

Due to the nature of public utility rates, the fare rates for rail services have mostly used to be based on cost. However, the various methods used in the customer-based pricing approach can be applied to railway services as well: examples include the estimation of demand and analysis of price elasticity of demand, relative value evaluation through comparison with other alternatives, and analysis of the maximum willingness to pay. By reviewing previously published related studies, we can apply the method of setting fare prices from the customer's point of view to the decision-making process of determining the fare rate level in various ways. Also, since this customer-based pricing approach reflects an understanding of the value of services perceived by customers, this approach makes it possible to operate railroad services more profitably through adjusted increases in fares or differentiation in fares. By using customer-based pricing for railway fares, railroad operators will be able to implement both customer-oriented marketing and profitability-oriented management.

Many railway services have hitherto operated at a loss. If an appropriate rate for both the GTX lines and the express services on existing railway lines is not considered, it will lead to a financial burden on the operating entity or local government. Services under a constant financial burden are more likely to experience other problems, including a deterioration in service quality. Therefore, when designing new rail services for the future, we need to apply a fare setting methodology from a balanced point of view rather than relying only on the public utility rate determination method or the cost-based rate setting method. A comprehensive system of pricing needs to be established, not only including the cost perspective but also taking account of the factors of demand, customers, competition and substitutes. By doing so, the operator of the railway services will achieve greater profitability, and service recipients will be provided with new values.

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