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Proposal of Public Buildings Value Evaluation: Considering User Performance Value

Ji Eun Park, Jung Ho Yu *

Department of Architectural Engineering, Kwangwoon University, Korea

*myazure@kw.ac.kr

Abstract

Deterioration of buildings not only means that degradation of basic building performance such as structural performance, energy performance, durability, and safety but also includes perceived deterioration which is focused on user-based approach. There are about 4.5 million buildings are over 15 years old in Korea and 72% of floorstock in the U.S belongs to buildings over 20 years old. Especially total amounts of public building have captured 2.5% of whole buildings in Korea. Therefore we are faced with different problems such as poor level energy efficiency, structural performance, and safety. To resolve these problems of increasing stocks of deteriorated buildings, decision making of reconstruction or remodeling is required. Lots of studies suggest various criteria for decision making to solve them and governments enact laws about evaluate public stocks already. But most of them are market price or book value. Therefore this study develops an integrated value evaluation method to evaluate public buildings to recommend a criterion of decision making on reconstruction or remodeling well-fitted to public buildings. A hybrid approach combines post occupancy evaluation (POE) with contingent valuation method(CVM), considering both permanent occupants and temporary visitors. This proposed method, which named POE-based CVM, considers a user performance and measures the user performance value. The value is measured by willingness to pay(WTP) considering user performance. This paper defines definition of user performance value. And a literature review explains applications of post occupancy evaluation(POE) and contingent valuation method(CVM). Proposed value evaluation will contribute to government for planning annual budget of operating public building efficiently and without waste.

Keyword: Public building, User performance value, Value evaluation, Contingent Valuation Method (CVM), Post Occupancy Evaluation (POE)

1. Introduction

1.1 Background

Global awareness of increasing building stocks is a significant issue today. For example, the present condition of the Korean government's budget represents a ratio of change for new

construction, which is much greater than repair or maintenance.

This means that the amount of increase presents building stocks that are greater than the amount of increase in new construction. In 2014 in Korea (MOLIT, 2014), there were about 4.5 million buildings that are more than 15 years old. According to a survey conducted by the U.S. Energy Information Agency, 72 percent of floorstock belongs to buildings more than 20 years old. Because of these situations, problems of deteriorated buildings keep increasing. Deterioration of buildings means that each part of the building elements is in deficient condition and causes degradation of structural performance, energy performance, durability, and safety. From the point of view of building users, reduction of building performance affects not only discomfort in real life but also psychological pressure according to continuous dissatisfaction in building elements. In other words, deterioration is the stress of using a building, and it spreads to become an overall social problem. (Min, 1990) Likewise, public buildings' average lifetime of use in Korea is 10 years. (Statistic Korea, 1987) However, strict budgets in operating and maintaining public buildings causes passive action in maintenance, repair, and rehabilitation. (Kim, 2003) It is necessary to prepare rationale and systematic evaluation standards for distributing the nation's budget efficiently. Therefore, it can reduce the nation's budget in facility management, reconstruction, and remodeling of public buildings. (Lee, 2009)

1.2 Objective

This paper's objective is to suggest a new value evaluation of public buildings considering user performance value. There are two main differences between private buildings and public buildings. First, private buildings have a price. They can be sold and bought in a market with parcel price. But in the case of public buildings, the value of buildings is priced by an average construction fee and land costs according to No. 38 in the Housing Act in Korea. Also, municipal and national libraries, police offices, and various public offices have no market. Second, only public buildings have externalities. According to Marshall (1890), externalities can materialize as an appropriate agglomeration pattern which facilitates asset sharing like the provision of specific goods and services by an input-output framework. In other words, each economic party can affect positive or negative externalities on other parties, not through market mechanisms. This paper focuses on the features of public buildings that have no market price and just have public service as externalities.

Table 1 Comparison between private buildings and public buildings

	Private buildings	Public buildings
Price	Parcel price	average construction fee and land costs
Externalities	x	Public services

Therefore, this paper offers a new value evaluation method that is appropriate to public buildings' characteristics as mentioned previously.

1.3 Scope and Method

There is no clear definition of public buildings in Korea; just different kinds of laws and acts mention it.

This paper offers value evaluation of public buildings considering building user performance. User performance refers to the overall satisfaction of building performance from permanent occupants and temporary visitors.

To measure the user performance value considering both deterioration of building and public services, this paper suggests a Post Occupancy Evaluation (POE)-based CVM. A POE takes a look at the permanent occupants and temporary visitors' satisfaction regarding public buildings with different weights according to relative importance. Likewise, the Contingent Valuation Method measures public buildings' value that is not traded in the real market. So the virtual market should be supposed and measure the exchange value. Therefore, public buildings value is measured by willingness to pay that is reflected by users' opinion of public buildings.

2. Related Works

2.1 State-of-the-Art Public Facilities Value Evaluation

2.1.1 Korea

According to National Property Act Article 14 and enforcement ordinance Article 9, all public buildings that are ordered by the Central Administrative Organization and use government budget are national property. Guidelines for the National Accounting Rules mention that the value of infrastructure should be specified in financial government statements. By depreciation on the accrual basis, tangible assets and infrastructure by national account standards is defined and classified following the nation asset valuation of the Ministry of Strategy and Finance. According to the National Property Act, applying methods like straight-line depreciation following economic durable years consider depreciation and appropriate historical cost. In the case of the public tract house, apartment

price is determined by the sum of the average construction fee and land costs following the Housing Act in the second clause of Article 38. At last, the Korea Appraisal Board declared the price of apartments to include public buildings.

2.1.2 Overseas

In the U.S., Governmental Accounting Standards Board (GASB) amended GASB 34 to enhance the obligation of central and local government. (GASB, 2000) The Amended GASB 34 offers two different valuation methods: one is the depreciation approach and the other is the modified approach.

The U.K. Department for Transport published the Guidance Document for Highway Infrastructure Asset Valuation in 2005. This guidance is more detailed than the GASB 34 about asset valuation. Road facilities are included in the depreciated replacement cost. (Lee, 2012)

Table 2 Public facilities value evaluation

Country	Book value	Market Price (Apartment Price)	Opinion of Users
Korea	O	O	X
U.S.A	O	O	X
U.K	O	O	X

2.2 Literature Review

2.2.1 Evaluation of Public Goods

The Contingent Valuation Method (CVM) can be a measurement tool to evaluate public goods. The CVM is used to evaluate non-market goods as a monetary unit, such as environment goods or public goods in a virtual market. This method was originally one of environment goods valuation in the political economy of environment. After that, it spread to other fields, such as traffic, culture, and other information services. The idea of the CVM was first presented by Ciracy & Wantrup. The concrete features are as follows: First, the CVM is free from restraint of the level of supplying goods or the policy of goods and benefits the authorities are willing to measure. Therefore, various results can be deducted. (Mitchell & Carson, 1989) Portney (1994) stated that valuation through CVM offers a greater opportunity for fundamentally and deeply improving the value than the economic preference theory. Second, CVM provides the only way to measure value, which cannot be measured by indirect methods in the market. (Hanemann, 1994) CVM is not a method used to evaluate value that people select in the real market about non-market goods, like the theory of revealed preference, such as the “travel cost” approach, but it is a method to

evaluate value by asking questions directly to people. The CVM compensates goods that are not dealt with in the market or can be used in the case that replaceable goods are not present. Third, evaluation through CVM can directly deduct a compensated demand curve.

Finally, the CVM can evaluate the number of people who don't consume non-market goods and can measure not only the use value but also the existence value. For example, the Korea Infrastructure Safety Corporation completed a study about repair and reinforcement to seismic performance improvement. In this study, they apply a use value to evaluate the value of public buildings by CVM.

2.2.2 Evaluation of Residential Performance

For many years, many definitions of post-occupancy evaluation (POE) have been defined; the most useful definition is the examination of the effectiveness for users of occupied designed environments. Wolfgang F.E. Preiser provided the following definition of POE: Post-occupancy evaluation is the process of systematically comparing actual building performance, performance measures, with explicitly stated performance criteria. These are typically documented in a facility program, which is a common pre-requisite for the design phases in the building delivery cycle. The comparison constitutes the evaluation in terms of both positive and negative performance aspects. POE was introduced in response to significant problems experienced in building performance with a particular emphasis on the building occupant perspective. For example, Howell (1976) said that POE examined elderly public housing dwellers' satisfaction with shared spaces, Brookes and Kaplan (1972) studied office workers' sense of privacy, and Knight (1978) studied institutional residents' aggressive and cooperative behaviors in various settings. Research in POE is diverse and is expanding rapidly. For example, Bechtel and Srivastava (1978) identified several researchers who had conducted housing evaluations, especially the type of design setting, such as housing, commercial offices, city, park, and academic institutions.

3. POE-Based CVM Considering User Performance Value

3.1 User Performance Value

There is no clear definition of user performance value in the dictionary or other works of research, so we identified the operational definition of user performance value. In this research, the concept of user performance value is increasing users' satisfaction in building performance or overall function. Building users are divided into two groups: permanent occupants who mostly use public buildings, for example, residential buildings, public offices, libraries, and police offices, and the other group includes temporary visitors like those in the local community

3.2 POE-Based CVM

In this study, we combine two different methods into the new value evaluation method. CVM uses willingness to pay to represent building value in economic value. It also considers users' opinion and examines non-market goods. Moreover, we considered residential performance and added elements of POE in our questions. We focused on the generally common set of problems in building performance as follows: security problems, leakage, poor signage and wayfinding problems, poor air circulation and temperature control, and aesthetic problems. First, indicative POEs involve structured interviews with key personnel and group meetings with public building users and derive key elements of POE from interviews with order of priority. They then include key elements to questions of CVM. We use the double-bounded dichotomous choice contingent valuation method. Targets of this evaluation are permanent users and temporary visitors, and we apply weighted value to each subject in POE-based CVM.

Weighted value is determined by different situations of the case study. Through the proposed method, user performance value is represented by value amount.

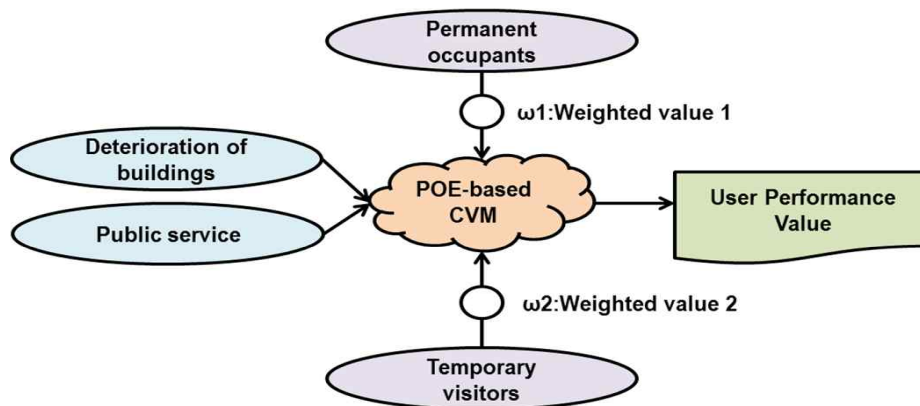


Fig. 1. Framework of POE-based CVM

4. Conclusion

In this paper, we proposed public buildings' value evaluation method to make new criteria of decision making for resolving problems caused by the deterioration of public building stocks. Combination of two different methods considers the deterioration of buildings and public services, because public buildings do not trade in the market and offer public service to the community. We thus applied the POE and Contingent Valuation Method to elicit the value of public buildings. This proposed method is called POE-based CVM. Since the proposed method can elicit public buildings' value to user performance value, it limits whether the value is meaningful to decide reconstruction or reformation of the public building in real situations. It only considers users' subjective opinion about building elements, so it is hard to generalize the total building's value. There is a necessity of case study with various kinds of existing public buildings, and we compare their results. We will conduct a case study with

office buildings and libraries and analyze two different situations in the future study. This method will offer one kind of buildings' performance value as a user's aspect of decision making regarding old public buildings.

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