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Evaluating the Performance of Public Involvement for Sustainable Urban Regeneration

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Abstract

In the last thirty years, public involvement has been adopted worldwide to foster sustainable development. However, little work has been done to study its actual project-based performance, which is critical for continual improvement. The paper proposes an evaluation model of public involvement in urban regeneration projects. We develop an evaluation framework with identified involvement goals, implementation objectives and measurement indicators, and construct an evaluation model combining the clustering algorithm and entropy weight theory. We also provide an example of the model to show its applicability.

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Keywords: Evaluation; Public Involvement; Urban Regeneration; Entropy Weight;

1. Introduction

Last 50 years have witnessed a huge wave of urban regeneration in big cities worldwide (UN, 2001; Lee et al., 2010), such as Shanghai, Hong Kong, London, etc. Indeed, urban regeneration endeavor has delivered development stimulus and vitality to old communities (Boyko et al., 2012), however, it is also faced with serious implementation roadblocks and sustainability problems. Urban regeneration not only is costly, time-consuming and hard to manage, but also brings about irreversible effects to the public (Garrett, 1995). Due to the dissimilar characteristics and intertwined stakeholders' interest entanglement inherent in different regeneration projects, there lacks a standardized and systematic, thus one-size-fits-all solution for delivering regeneration (Kim et al., 2009; Ho et al., 2012). Moreover, unsustainable regeneration can affect the micro-climate of a community, exceed the economy's

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absorption capacity, cause social exclusion, and arouse public opposition (Gilbert, 2009; Lee et al., 2010; Lee and Chan, 2008; Ho et al., 2012).

In this context, public involvement is developed and widely used in urban regeneration projects. However, despite nearly three decades of experience associated with public involvement endeavors worldwide, successful public involvement still remains an uncertain problem (Wolfe et al., 2001). This paper aims to propose an evaluation model targeted at public involvement applied in urban regeneration. It is not only critical for measuring the success of public involvement efforts, but more importantly, also for improving the endeavor as it unfolds (Sewell and Phillips, 1979).

2. Literature review

In the last decade, a growing attention on urban regeneration sustainability both conceptually and operationally is gradually developed (Wedding and Crawford-Brown, 2007). Sustainability has gradually evolved from ecological viewpoints into a holistic understanding including physical, social, economic, cultural, and environmental concerns (Lee et al., 2010). In the urban context, as Roberts and Sykes (2000) pointed out, a new form of urban regeneration is characterized by the emphasis on the "three pillars", i.e. the concept of sustainability, strategic vision and partnership. Sustainable regeneration, as argued before, is much more than physical renewal. It is characterized with its emphasis on balancing the long term and multi-dimensional perspective, and the interweaving of economic, social and environmental issues (Gullino, 2009; Robert and Sykes, 2000).

With an eye to the sustainability in urban regeneration, public involvement in the decision-making process is widely acknowledged as necessary (Burke, 1968; Ng et al., 2001). The urban environment, especially regeneration in this environment (Catney and Lerner, 2009), involves the management of many different forms of expertise from decision-makers with multi-disciplinary backgrounds, making it a difficult task to manage and converge these expertise and opinions (Evans and Marvin, 2006). Local communities can play an important role in finding feasible urban solutions, as they are living in real-world problems (Gullino, 2009). As Fitzsimons et al. (2012) concluded, the benefit of public involvement is that during the process there are opportunities to both refer to "external" (e.g., expert, or published) knowledge and absorb "local" knowledge, and that by doing this the outcome should build a shared consensus, improve public understanding, predict future problems and minimize conflict towards a long-run sustainability.

In recent years, the evaluation of public involvement has aroused some attention, although not much, in the literature of various technical fields. O'Faircheallaigh (2010) discussed the main purposes of public involvement in Environment Impact Assessment (EIA) and considered how to interpret and value the performance of the involvement. Wolfe et al. (2001) also address the evaluation problem for National Assessment of Potential Consequences of Climate Variability and Change (NACC) in EIA. Kramer et al. (2012) established a Public Involvement Performance Measurement Data Collection and Analysis Tool (PIPM) with Microsoft Access database in transportation planning.

3. Goals, objectives and indicators

For an evaluation model, it is essential to define the purpose for which the evaluation we are constructing, which is established to track progress towards the purpose (Kramer et al., 2013). Our performance evaluation model sought to determine the extent to which public involvement goals have been achieved. The three most common goals of public involvement in urban regeneration are 1) informing and educating, 2) promoting information exchange and interaction and 3) seeking public input (Väntänen and Marttunen, 2004; O'Faircheallaigh, 2010). We focus on the measurement of outcome (i.e. whether the goals are achieved in complicated environments) through the output (i.e. how the process is managed and what techniques are adopted) of public involvement.

Then, we identify the objectives and indicators of the model by vast literature study, which constitute a fundamental part of evaluation. The goals and indicators in this paper are widely adopted from Booth and Richardson (2001), Wolfe et al. (2001), Becker et al. (2003), Väntänen and Marttunen (2004), Doody et al. (2009), O'Faircheallaigh (2010), and Kramer et al. (2013). The following objectives were established as a means to meet our goal:

- Equity: Involve all stakeholder parties and provide equitable access.
- Transparency: Publicize regeneration project-related information to the public.

- Interactivity: Provide sufficient opportunities for discussion workshops or debate on regeneration issues with suitable techniques.
- Inclusivity: Be open-minded about negotiable matters in urban regeneration and readily to include the idea from the public.

Table 1. Evaluation Framework: goals, objectives and indicators

Goals
● Informing and educating
● Promoting information exchange and interaction
● Seeking public input
Objectives and Description of Their Indicators
Inclusivity
● Participants feel that the negotiable matters are critical to the regeneration project
● Participants are involved in an early phase of the regeneration project.
● Evidence that feedback on public involvement input is provided.
● Evidence of how public involvement inputs were used to shape the regeneration decision.
Equity
● Participants feel satisfied with the representation of the involvement group to the community.
● Participants feel satisfied with efforts to accommodate persons with disabilities.
● Participants feel involvement activities are held at convenient time and location.
● Information is provided in languages other than English, and translators are available.
Transparency
● Participants feel that ample notice is provided of public involvement activities.
● Participants feel that information provided on the regeneration project is adequate and clear.
● Response to public inquiries is timely and convincing.
● A clear presentation of the results of public involvement is given.
Interactivity
● Participants feel that an adequate number of techniques are used to get them involved on regeneration issues.
● Participants feel they have adequate opportunities to participate in the decision-making of regeneration issues.
● Participants agree that techniques were of value in capturing their input.
● Participants agree that techniques were of value in conveying project information.

To measure if each objective is achieved, a set of measurement indicators with quantitative target values are necessary for each objective. Due to the different goals of different public involvement endeavors, the objectives can be somewhat different. For example, for one involvement project only aiming at informing and educating, transparency may be the most important objective, while inclusivity may have little value in planning and implementing the involvement. Table 1 summarizes the evaluation framework.

4. Evaluation model

As we have identified the evaluation framework for evaluating public involvement, the next step is to develop an evaluation model to process the feedback from the participants on the indicators. The evaluation can be seen as a

single-plan multi-attribute large decision problem. In the literature, dealing with this kind of problem often involves three steps: first, divide the large group of participators into several stakeholder groups according to their preferences; second, aggregate the preferences of multiple groups to obtain the large group's opinion by each indicator; third, determine the weight for the evaluation indicators and calculate the overall evaluation result.

Similarity measure has been widely used in large group clustering. Various forms of similarity measures have been proposed in the literature, such as similarity distance measure (Hung and Yang, 2004), cosine measure (Ye, 2011), intuitionistic fuzzy number (Abbasbandy and Hajjari, 2009) and grey theory (Wei and Wei, 2008). In terms of weight determining, major established methods for this problem include: judgment matrix based on the weighted least-squares method (Chu et al., 1979), AHP method (Saaty, 1977), entropy weight method (Hwang and Yoon, 1981; Li et al., 2008), MoM method (Hwang and Yoon, 1981; Hwang and Lin, 1987), fuzziness method (Hsu and Chen, 1976; Olcer and Odabasi, 2005) and so on. Among these, entropy weight method is widely used in tackling practical large group decision problems these years (Li et al., 2014 and Lin et al., 2015).

Here, our model combines the grey rational clustering analysis (Zhu et al., 2015) and the entropy weight theory (Li et al., 2008). We present our model below.

4.1 Group clustering

Assume the number of evaluation indicators is m, and the number of evaluating participants is n in the involvement group Ω. Denote x_{ij} as the non-negative rated satisfaction score of participant i on indicator j of the group Ω. Then the evaluation result of the involvement project valuated by participant i forms an evaluation vector V_i, and $V_i = [x_{i1}, x_{i2}, \dots x_{im}]$. The degree of the aggregation between the evaluation result of participant i_1 and participant i_2 can be defined as follows:

$$r_{i_1,i_2} = \frac{|V_{i_1} - \overline{V_{i_1}}|(|V_{i_2} - \overline{V_{i_2}}|)^T}{\|V_{i_1} - \overline{V_{i_1}}\|_p \|V_{i_2} - \overline{V_{i_2}}\|_q} \quad (1)$$

where $\overline{V_{i_1}} = {(s\sum_{j=1}^{m} x_{i_1 j})}/{m}$, and $\overline{V_{i_2}} = {(s\sum_{j=1}^{m} x_{i_2 j})}/{m}$, s is a m-dimension unit vector. The coefficients p and q satisfy that $p, q > 1$, and ${1}/{p} + {1}/{q} = 1$. $\|\cdot\|_p$, and $\|\cdot\|_q$ denote p-norm and q-norm of a vector respectively. Therefore, the degree of aggregation between i_1 and i_2 satisfies $0 < r_{i_1,i_2} < 1$.

Let γ be the threshold value of clustering. Then if and only if $r_{i_1,i_2} > \gamma$, i_1 and i_2 are divided into one cluster.

4.2 Satisfaction of the clusters

Let C_k denote the cluster k of the evaluation participants, and n_k denote the number of participants in C_k. Assume the total number of clusters is K. The satisfaction of the whole involvement group Ω can be obtained by integrating the satisfaction of all the clusters. So the normalized satisfaction vector of cluster C_k is defined as follows:

$$G_k = \frac{\sum_{V_i \in C_k} V_i}{\|\sum_{V_i \in C_k} V_i\|_2} \quad (2)$$

The satisfaction of the cluster combines all the evaluation of the participants in that cluster. As a result, the satisfaction of the cluster can represent the satisfaction of all the participants in the cluster properly.

4.3 Satisfaction of the group

The satisfaction of the involvement group Ω can be obtained by the weighted sum of all the satisfaction vectors of clusters. Thus, the satisfaction of the group can be defined as follows:

$$\hat{E} = \sum_{k=1}^{K} \frac{n_k}{n} G_k \quad (3)$$

Then a standardized vector E can be obtained by standardizing vector $\hat{E}$, which is the final satisfaction vector of the group.

4.4 Evaluation indicator entropy

The entropy of indicator i can be defined as follows:

$$H_i = -\frac{1}{\ln n} \sum_{j=1}^{n} f_{ij} \ln f_{ij}, i = 1,2,3, \dots, n; j = 1,2,3, \dots, m \quad (4)$$

$$f_{ij} = \frac{x_{ij}}{\sum_{j=1}^{n} x_{ij}} \quad (5)$$

If $f_{ij} = 0$, we suppose that $\ln f_{ij} = 0$.

4.5 Entropy weight

According to the definition of entropy, the larger the entropy is, the smaller the difference is between the rated value and the optimal value of the indicator. Denote the entropy weight of indicator i as w_i, So, the entropy weight is defined as follows:

$$w_i = \frac{1 - H_i}{m - \sum_{i=1}^{m} H_i}, i = 1,2,3, \dots, n \quad (6)$$

From the formula, we can obtain the indicators weights vector as $W = [w_1, w_2, \dots, w_m]$.

4.6 Project evaluation score

The project evaluation score can be obtained by multiply the transpose satisfaction vector E with the entropy weight vector W. That is

$$S = W \cdot E^T \quad (7)$$

5. Example

City Prosperity aimed to execute a regeneration project on Community A by building a new comprehensive commercial center to boost its economic development. Because the regeneration project involved removing a primary school in the community, the project team decided to bring public involvement into the regeneration project. The main goal of the involvement is informing and educating, reducing misunderstanding and opposition of the community. According to the goals, the project manager identified equity and transparency as the objectives of the involvement. The indicators, rated in a five-score scale after the involvement by 14 participants, are summarized in Table 2 below.

Table 2. Evaluation from 14 participants on 8 indicators

	Indicator 1	Indicator 2	Indicator 3	Indicator 5	Indicator 6	Indicator 7	Indicator 7	Indicator 8
Participant 1	4	3	4	5	4	4	3	3
Participant 2	3	3	3	4	4	5	3	4
Participant 3	5	4	4	5	3	5	4	3
Participant 4	3	4	5	4	4	4	2	3
Participant 5	3	3	4	4	3	4	2	2
Participant 6	4	3	3	4	4	3	1	4
Participant 7	3	2	4	3	3	5	3	4
Participant 8	3	4	2	4	4	5	2	3
Participant 9	5	4	5	3	5	4	2	3
Participant 10	2	4	4	4	3	4	2	4
Participant 11	4	5	2	4	4	4	3	3
Participant 12	2	3	4	5	3	5	3	4
Participant 13	4	2	3	5	4	3	2	3
Participant 14	3	4	3	5	4	3	4	3

The threshold value should satisfy the condition that a sensible number of subgroups can be determined. This relates to the number of detectable stakeholder parties involved in the public involvement process. Therefore, a sensible number of subgroups should be close to the known stakeholder parties to make the clustering be of practical significance. Here, since the public involvement organising group have reasons to believe that five different interest parties coexist in the involvement participants, we set the clustering threshold $\gamma = 0.8$ to make the number of clusters five, since the exact number of stakeholder parties are involved. Using the clustering algorithm, the participants can be divided into five clusters shown as follows:

Table 3. Clustering results and satisfaction vectors of clusters

Clusters	Number of cluster participants	Clusters participants	Standardized satisfaction vector of the cluster
1	2	10,12	(0.19, 0.34, 0.39, 0.44, 0.29, 0.44, 0.24, 0.39)
2	3	1,6,13	(0.40, 0.26, 0.33, 0.47, 0.40, 0.33, 0.20, 0.33)
3	4	3,8,11,14	(0.35, 0.40, 0.26, 0.42, 0.35, 0.40, 0.30, 0.28)
4	2	2,7	(0.29, 0.24, 0.34 ,0.34, 0.34, 0.49, 0.29, 0.39)
5	3	4,5,9	(0.35, 0.35, 0.45, 0.35, 0.38, 0.38, 0.19, 0.26)

Therefore, the satisfaction vector of the involvement group is

$$E = (0.34, 0.36, 0.32, 0.39, 0.35, 0.39, 0.30, 0.32)$$

The weight of the indicators can be obtained as

$$W = (0.16, 0.14, 0.15, 0.06, 0.06, 0.07, 0.25, 0.07)$$

Therefore, the involvement evaluation score is $S = W \cdot E^T = 0.34$. The evaluation result reveals that the participants are not quite satisfied with the public involvement process. The essential reason accounting for the poor performance lies in the low rated score on Indicator 7, which bears the largest weight among the eight indicators. The project should be looked back upon relative issues to pursue continual improvement.

6. Conclusion

We propose an evaluation model based of urban regeneration public involvement projects in this paper. The evaluation framework is obtained by vast literature review, and we combine the characteristics of public involvement and urban regeneration. The model highlights that the goals of public involvement varies according to different urban regeneration projects, and that the satisfaction of different stakeholders can be different for one project. And we also provide an example using the model to show its applicability.

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