

# Quantifying Social Value Information Using Analytical Hierarchy Process Method

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## Abstract

This study aims to develop a methodology that can quantify social value at the practical level, considering that it is difficult to quantify the social value information of individual businesses despite the importance of social value both in practice and academia. As people's living standards rise, the gap between rich and poor has widened, and this phenomenon is broadening the scope of the social welfare projects that central and local governments must carry out. In this context, quantifying the social value information that each project will have is extremely important. However, the reality is that the social value quantification work undertaken in academia has up until now been carried out on an abstract level, because the methodology has not been established. In addition, established social value quantification methodologies embody a problem: it is difficult for policymakers to utilize them, because they represent difficult processes that, in respect of each individual project, require large amounts of professional knowledge, data, time and money if they are to be carried out satisfactorily. Against this background, this study aims to present a single social value quantification methodology that policymakers can employ easily in all circumstances. If the social value quantification method presented in this study, the Analytical Hierarchy Process (AHP) method, is properly applied, then, since it is information and data -based methodology, it should prove meaningful as a practical alternative to existing methods.

**Keywords:** quantifying social value, AHP, data and information-based methodology.

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## 1. Introduction

Today, as the Government's interest in social welfare increases, new social welfare policies are emerging in various forms, in addition to the traditional social welfare policies already provided. As the budget for social welfare policies is expanding daily, the effectiveness of social welfare policies is becoming an issue. The reason for this is not that the meaning of social welfare policy itself is weak, but relates to the question as to whether economic and social values are sufficiently generated compared to policies in other fields. In addition, when two or more projects are included in the same social welfare policy category, the problem of choice arises when resources are limited. This

problem of choice as to which social welfare projects should be prioritized by government should be resolved.

For example, suppose a local authority has limited resources, say, 1 million USD. In this case, it might be assumed that it has two business alternatives: one, to use this sum to build a small library, and the other to implement a healthcare project for the elderly in the village. These two businesses have different recipients of their benefits, and provide different types of benefit. In this case, supposing only one of the two is to be selected, the problem of choosing between them can be solved in a rather simple way by calculating only their respective economic benefits and costs. If, however, comparisons need to be made by evaluating their economic and social value together, and not just their respective economic values, the problem is completely different. Today, when central and local

government compare and evaluate policy alternatives, they face this same evaluation problem. Before the concept of social value took on importance, they went through the process of evaluating alternatives by relying only on the results of economic value evaluation.

Given that it is now seen as important to compare and evaluate alternatives by evaluating not only economic but also social value, the problem that arises is how to conceptualize and measure the latter. This is a difficult problem, and although various methods have been put forward for solving it, an easy measurement technique that most researchers can agree on has not yet emerged. The reason for this is that, even if the concept of social value is defined, it is very difficult to measure such value precisely, due to its non-market characteristics. But if an easy method for measuring 'social value' is not utilized, many problems may arise in practice. In consequence, it is difficult to prioritize investment in social policy projects that are expected to expand in terms of budgetary scale, or to evaluate the results of policies. Even though it is urgently necessary to develop a methodology that can conceptualize and measure social value, it is difficult to develop an optimum methodology that can satisfy most policymakers and academic researchers within a short period of time.

Recognising these issues, this study aims to contribute to the development of a methodology for measuring the social value brought by policies and projects in the social field. In order to achieve this, it first redefines the concept of social value, making it possible, secondly, for public officials who decide upon and implement social policy to measure the social value of a given policy in a basic way before implementing it.

## 2. Discussion of social values and measurement methods

### 2.1 Redefining social values

Recently, many researchers (Alker, 2020; Cuentas Figueroa et al., 2023; Emerson and Chun, 2020; Fujiware and Dass, 2020; Hernández Tique et al., 2022; Lali et al., 2023; Lautermann, 2013; Mulgan, 2013; Newcastle City Council, 2021) have tried to define the concept of social value in accordance with their research background. These definitions may be divided into several categories, as follows.

The first view (Alker, 2020; Mulgan, 2010; Alves Salgueiro et al., 2023; Lali & Chakor, 2023; Omideyi, 2020; Reeder, 2014; Salford CVS, 2021) comprehensively defines social value as 'value that can contribute to the public interest and the development of the community'. This view asserts that social values relate to the public interest, not the individual interest. However, these arguments do not provide a clear definition of what the 'public interest' specifically is. Therefore, it is not easy to measure the social value of any business on the basis of these arguments.

Second, some researchers (Fujiware and Dass, 2020; Lautermann, 2013; Olusegun Oyotola et al., 2023; Social

Value Salford, 2021) claim that social value can be defined as a value that can contribute to the 'public interest' and 'community development'. These researchers focus on concepts such as human rights, safety, labour, jobs, health and welfare, support for the socially vulnerable, win-win co-operation, regional co-operation, the local economy, community restoration, social responsibility, and ethics, which are important today. They argue that management, environment and participation are the core values of social value. This view can be said to represent a step forward compared to that of previous studies in that it specifically expands the field of social value. However, even these researchers do not offer many detailed suggestions for measuring social value. In particular, in expanding the field of social value, they fail to suggest which aspect of it should be focused on in measuring it.

A third view defines social values as values (including economic values) generated by various activities aimed at solving the social problems of the time while focusing on improving the quality of life of the socially disadvantaged (de Sousa Netto & Luiz Pinto, 2022; Local Government Association, 2021; Maas & Liket, 2011; Morgan, 2019; Murphy, 2011; Gloucester City Council, 2020; Grieshaber, 2021). This view may be distinguished from other claims in that it sees the core of social value as realizing the interests of the socially disadvantaged.

As is evident from the above, researchers have offered various definitions of social values from various viewpoints. Although there are some commonalities among the various arguments around the concept of social value, it is still difficult to define the concept clearly. Given these circumstances, in this study social value is defined as 'a value that has a positive effect on society as a whole, including not only the economic benefits of the socially disadvantaged, but also the psychological benefits that the promotion of economic benefits will bring'. The social value characteristics defined in this study may relate to the interests of the socially underprivileged rather than the general public's interests. At the same time, the definition differs from those put forward in previous research in that it encompasses both economic and psychological benefits for service recipients.

### 2.2 How to measure social value: discussion

Academics (Hanemann, 1984; Jiménez-Franco et al., 2022; Kim, 2004; Kriström, 1997; Kriström, 2019; Raiden, 2021; Silva, 2022) who study economics or statistics have made great efforts to measure social value both quantitatively and qualitatively. The major quantitative methods are the Logic Model, Social Return on Investment (SROI), System Dynamics, and the Contingent Valuation Method (CVM). These methods do not exist independently of each other, and two or more methods (e.g. SROI and System Dynamics) are sometimes used to complement each other.

The main qualitative method involves a questionnaire sent to experts or service beneficiaries to evaluate social value. It is difficult to evaluate which method, the quantitative or the qualitative, is superior. As a result, it is necessary to

compensate for the limitations of each method by mixing the two.

One more point must be mentioned in this regard. In the process of measuring social value, it is important for policymakers to evaluate the social value of a specific business in a simple and concise way. For example, if CVM is used to evaluate the social value of a specific project with a project cost of 1 million dollars, a questionnaire must be created to measure the social value of each individual project, which takes an enormous amount of time because it has to be distributed to the beneficiaries before the responses are analysed, and the analysis requires professional analytic skills. Enacting this process is not impossible; however, since it requires a lot of time and professional ability, it is difficult in practice for administrative agencies to themselves possess all the competent experts required to do this. As a result, administrative agencies that implement such policies have no choice but to rely on specialized research institutes or advisory companies to measure social values.

In the light of these circumstances, it is important for institutions that decide upon or implement social policies to explore a methodology for measuring social values that can offer the important relevant implications, even if this methodology is not entirely sophisticated. To solve this problem, this study proposes Analytical Hierarchy Process (AHP). The AHP method is used when it is desired to set a weight by measuring several alternative items. It is a method that allows the respondent to determine the weight between items to be compared via the pairwise method.

When utilizing the AHP method, the following should be considered. First, the items that constitute the social value that a specific business will bring must be included accurately. Since the characteristics of social policies are diverse, the AHP questionnaire should be well-designed, so that these various characteristics can be included satisfactorily. Second, unlike other questionnaire methods, AHP does not target the general population or service beneficiaries, but allows experts in the field to respond. That is, responses should be elicited by targeting experts who have adequate professional knowledge about the service or policy. Third, the method partially acts as an alternative to Input-Output (I-O) analysis, which analyses the economic costs and benefits of specific projects so as to analyse business feasibility. Economists use I-O analysis to determine the feasibility of businesses in the general economic sector. It is a method for analysing the economic ripple effect expected from a specific project by using the

employment inducement coefficient, the value-added inducement coefficient and the income inducement coefficient that occur when a specific public project is implemented.

This method can be handled relatively simply if only basic information about the project, such as its size or type, is known. Such a methodology is also required in the area of social value measurement, and so the AHP method is meaningful in that it can derive results in a relatively simple and short time-frame, just like I-O analysis.

Considering previous studies (Führ & Bisset Alvarez, 2022; Ismail Adakawa et al., 2022; Omo-Ikerodah, 2020; Powell, 2019; Social Value Salford, 2021; Springer Link, 2021; Social Enterprise Unit, 2010; Smith & Stevens, 2010; Walzer, 1987; Wood, 2010) relating to the evaluation of social values from a methodological point of view, we observe, first, that most of the theoretical studies have related to social values. Second, as regards studies dealing with actual cases, methods such as SROI or CVM are applied. However, the process of analysing individual cases and drawing conclusions is overly complicated and time-consuming, regardless of whether application of these methods is appropriate. By contrast, when social value is evaluated by applying the AHP method, it is possible to utilize indicators and weights reflecting the characteristics of the administrative agencies that promote and execute the social policy, so that the specificity of the region or field can be reflected well. Furthermore, by using the responses of experts, it is possible to obtain the evaluation result by processing the degree of social value for the current or future projects in a relatively simple way.

### 3. Analysis design

#### 3.1 Composition of the AHP questionnaire

The structuring of the AHP items that can be applied when the AHP method is used to compare and evaluate what kind, or amount, of social value a particular social policy or business has is shown in Figure 1. This structure was established on the basis of the results of previous studies dealing with social policies and projects. However, this being a theoretical-level study on the structure of the AHP questionnaire, in the future this questionnaire structure should be continuously supplemented by reference to follow-up studies. The ultimate goal of the pursuit of social values is indicated in the first layer of Figure 1.

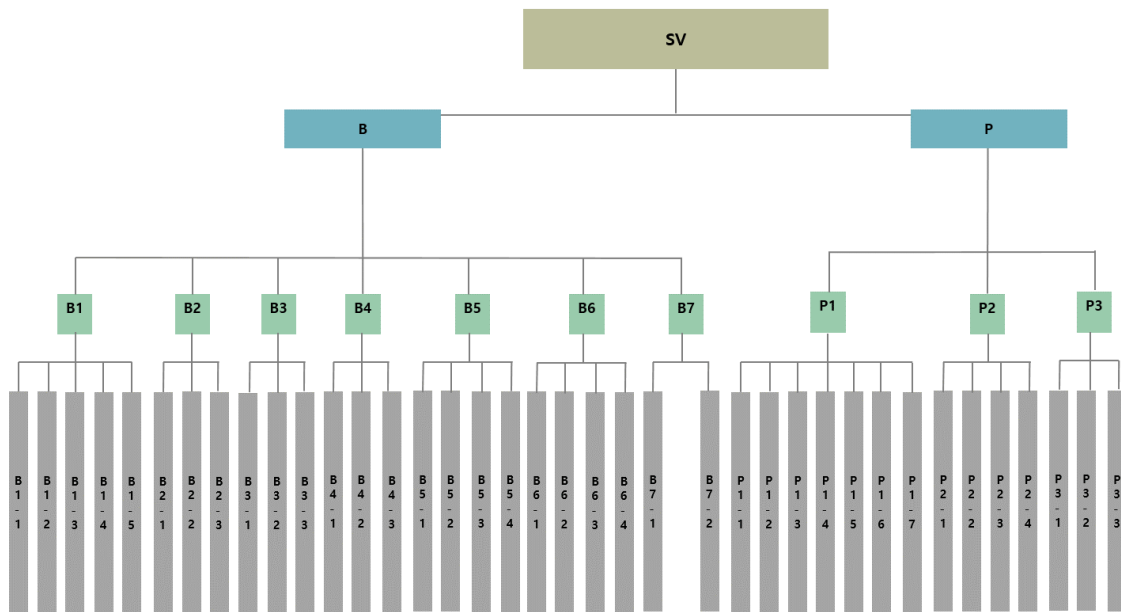


Figure 1 Structure of AHP questions

The second tier, which is shown below the goals of the first tier, is largely divided into the nature of the business and the delivery method of a specific welfare project. In other words, it is assumed that the scale of social value may vary according to the different beneficiaries of the project, even if it is a project of the same size (e.g. A is a library construction project, B is a health promotion project for the elderly). In addition, it is assumed that the degree of social

value may vary depending on the method used for delivering a specific business, due to the characteristics of the specific method of delivering services.

Table 1 explains each indicator included in the structure of the AHP question.

Table 1 Description of indicators

Tier 1	Tier 2	Tier 3	Tier 4	Remarks
Social value weight (SV)	Personal characteristics of the beneficiary (B)	Economic level (B1)	Lowest class (B1-1)	
			Second class (B1-2)	
			Median (B1-3)	
			Middle class (B1-4)	
			High-income class (B1-5)	
		Disabled (B2)	Non-disabled (B2-1)	
			Severely disabled (B2-2)	
			Mildly disabled (B2-3)	
		Age (B3)	Youth (B3-1)	
			Middle-aged (B3-2)	
			Seniors (B3-3)	
		Jobs (B4)	Full-time (B4-1)	
			Temporary workers (B4-2)	
			Unemployed (B4-3)	
		Educational level (B5)	No public education at all (B5-1)	
Elementary/secondary				

	Project characteristics (P)		graduate (B5-2)	
			High school graduate (B5-3)	
			College graduate or higher (B5-4)	
		Minority (B6)	Ordinary people (B6-1)	
			Multicultural (B6-2)	
			LGBTQ (B6-3)	
			Religious minorities (B6-4)	
		Gender (B7)	Male (B7-1)	
			Female (B7-2)	
		Project area (P1)	Vulnerable class (P1-1)	
			Elderly (P1-2)	
			Disabled (P1-3)	
	Public health (P1-4)			
	Female (P1-5)			
	Youth (P1-6)			
	Residential (P1-7)			
	Delivery method (P2)	Cash (P2-1)		
		Voucher (P2-2)		
		Goods (P2-3)		
		Personal service (P2-4)		
	Recipient (P3)	Self (P3-1)		
Family (P3-2)				
Institutions/others (P3-3)				

Taken together, Figure 1 and Table 1 show that the components included in the social value system are assumed to have the individual characteristics of the beneficiary of the project and the characteristics of welfare projects in a broad sense. The sum of the value of the characteristics of the beneficiaries and the value of the characteristics of the welfare project is 1. For example, given a welfare project 'A', the social value of this project may vary depending on who its beneficiaries are. If the beneficiary of this project is a person from a poor class, it can be assumed that the social value will be greater than that if a person from a wealthy class were the beneficiary. In the same way, the social value will differ depending on how the project is delivered to its beneficiaries.

In addition, it may be assumed that the degree of social value may vary among the various components constituting the individual characteristics of the beneficiary (UK GBC,

2021; Tomlins, 2015; Flores et al, 2023; Social Enterprise Unit, 2021; Social Value International, 2021; Molinet Rojas et al., 2022) and that it will vary too among the components constituting the characteristics of the welfare project. The method of weight selection through comparison between each item naturally has its own limitations. Nevertheless, the methodological advantages of this method also exist at the same time.

### 3.2 Selection of experts for weight selection

In this study, an expert panel consisting of one social welfare expert, one economics expert and one public administration expert was formed and asked to answer the questionnaire. AHP questionnaires for responses were distributed and collected between 5 and 8 October 2021. Consistency Ratio (CR) was calculated to obtain the reliability between the responses of these respondents, and

the CR value was 0.05, indicating that the problem of consistency among respondents was resolved.

3.3 Measurement software

In this study, the EXPERT CHOICE 2000 program was used to derive the weights between the indicators, and after deriving the weights, simulations were performed to analyse which changes in the items bring a big difference to the results.

4. Analysis results and implications

4.1 Weight among all items

In order to measure the social value brought by individual policies or projects relating to social welfare, in this study the social value of the first tier was divided into the individual characteristics of the beneficiaries and the characteristics of the welfare project in the second tier. Considering the relative importance of these two items in terms of social value, it is the characteristics of the beneficiaries who are the target of the project that have the greater importance. In other words, from the point of view of social value, it is very important who the beneficiaries of the project are (weight 0.889), as shown in Table 2. On the other hand, the project characteristic of the welfare project is

0.111, indicating that it does not correspond to 1/3 of the social value of the project beneficiary characteristic.

Table 2 Characteristics of project beneficiaries and result table for project characteristics (social value weighted)

```

Goal:SV (Social Value)
├── B (L: .889 G: .889)
│   ├── B1 (L: .543 G: .483)
│   ├── B2 (L: .151 G: .134)
│   ├── B3 (L: .073 G: .064)
│   ├── B4 (L: .115 G: .102)
│   ├── B5 (L: .043 G: .038)
│   ├── B6 (L: .046 G: .040)
│   └── B7 (L: .030 G: .027)
├── P (L: .111 G: .111)
│   ├── P1 (L: .196 G: .022)
│   ├── P2 (L: .311 G: .035)
│   └── P3 (L: .493 G: .055)
    
```

As the analysis result presented in Table 2 shows, among the characteristics of the beneficiaries of the project, the economic status indicator (B1: 0.543) is given a higher weight than the values of other indicators, and the gender indicator has the lowest weight (B7: 0.030).

Figure 2 shows the individual weights of the 38 indicators included in all four layers.



Figure 2 Individual weights of the 38 indicators: graph

Meanwhile, Table 3 shows the details of the beneficiary characteristics of the project, the nature of the project, and

the weight values of the detailed indicators included in each layer.

Table 3 Characteristics of project beneficiaries and results table for project characteristics (social value weighted, re-arranged)

Tier 1	Tier 2	Tier 3	Tier 4	Weight
Social value weight (SV): 1	Personal characteristics of the beneficiary (B): 0.889	Economic level (B1): 0.543	Lowest class (B1-1)	0.290
			Second class (B1-2)	0.111
			Median (B1-3)	0.051
			Middle class (B1-4)	0.021
			High-income class (B1-5)	0.010
		Disabled (B2): 0.151	Non-disabled (B2-1)	0.009
			Severely disabled (B2-2)	0.096

Project characteristics (P): 0.111	Project characteristics (P): 0.111		Mildly disabled (B2-3)	0.029		
		Age (B3): 0.073	Youth (B3-1)	0.004		
			Middle-aged (B3-2)	0.011		
			Seniors (B3-3)	0.050		
			Jobs (B4): 0.115	Full-time (B4-1)	0.006	
		Temporary workers (B4-2)		0.019		
		Unemployed (B4-3)		0.077		
		Educational level (B5): 0.043	No public education at all (B5-1)	0.021		
			Elementary/secondary graduate (B5-2)	0.012		
			High school graduate (B5-3)	0.004		
			College graduate or higher (B5-4)	0.002		
		Minority (B6): 0.046	Ordinary people (B6-1)	0.040		
			Multicultural (B6-2)	0.022		
			LGBTQ (B6-3)	0.007		
			Religious minorities (B6-4)	0.007		
		Gender (B7): 0.030	Male (B7-1)	0.009		
			Female (B7-2)	0.018		
		Project area (P1): 0.196	Project area (P1): 0.196	Vulnerable class (P1-1)	0.009	
				Elderly (P1-2)	0.003	
				Disabled (P1-3)	0.005	
				Public health (P1-4)	0.002	
	Female (P1-5)			0.001		
	Youth (P1-6)			0.001		
	Residential (P1-7)			0.001		
	Delivery method (P2): 0.311			Delivery method (P2): 0.311	Cash (P2-1)	0.002
					Voucher (P2-2)	0.004
					Goods (P2-3)	0.007
		Personal service (P2-4)	0.022			
	Recipient (P3): 0.493	Recipient (P3): 0.493	Self (P3-1)	0.034		
			Family (P3-2)	0.015		
			Institutions/others (P3-3)	0.005		

In Figure 3, the weights of the 38 indicators as presented above are shown re-arranged from high to low.



Figure 3 Individual weights of the 38 indicators: graph, based on high values

Figure 4 shows the results of simulation using the simulation function built into the Expert Choice 2000 program. In other words, the simulation aims to predict how sensitively the

weight of each indicator given in the initial analysis changes according to changes in circumstances.

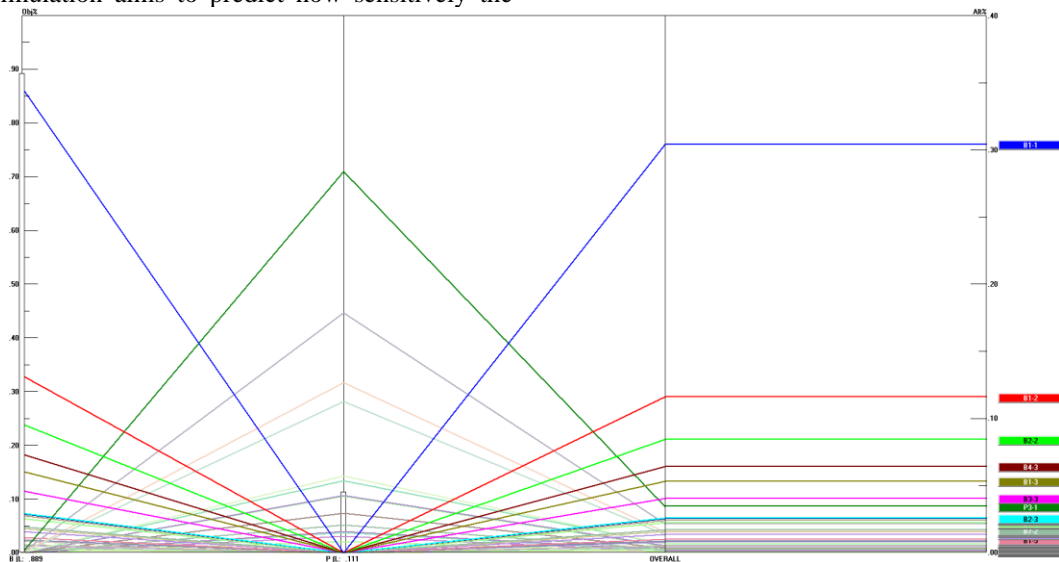


Figure 4 Weights of individual indicators (step before simulation)

Figure 5 shows the weight values of individual indicators before simulation.



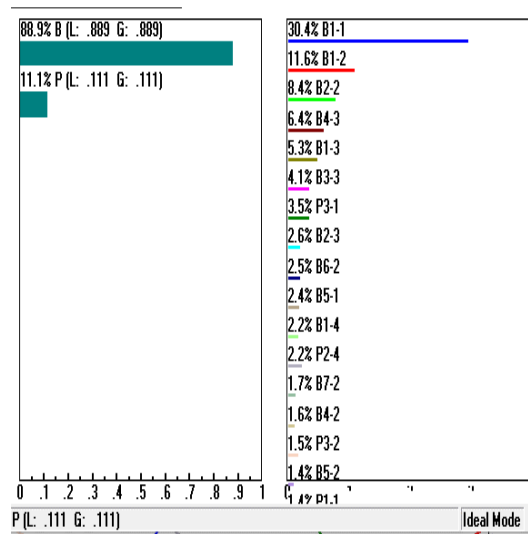


Figure 5 Weights of individual indicators before simulation

Looking at Figure 5, we see that the weight of ‘characteristic of the project’ is expressed as 0.111. When the personality weight of the project is increased by around 50 per cent from the current 0.111, it becomes circa 0.168. Even in this case, B1-1 has a weight of 25.8 per cent, as shown in Figure 6, which is only slightly reduced from the existing weight value (30.4%). That is, it can be seen that the weight of B1-1 is fairly firmly kept high.

Figure 6 shows the situation when the weight of ‘business personality’ is increased by 50 per cent compared to the first.

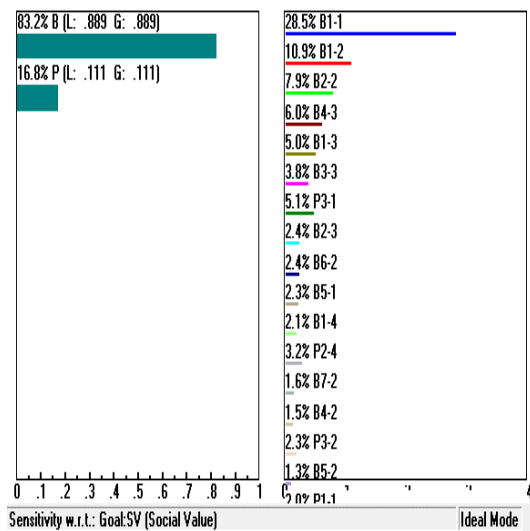


Figure 6 Simulation 1

Figure 7 shows the results of simulation 2 (when the weight of ‘business nature’ is increased by 100% compared to the first). Here, even when the ‘project character’ indicator is set to 0.221 by around 100 per cent higher than the initially generated weight value, the

weight of the B1-1 indicator is 26.7 per cent, which is only slightly lower than the initially-given value (30.4%).

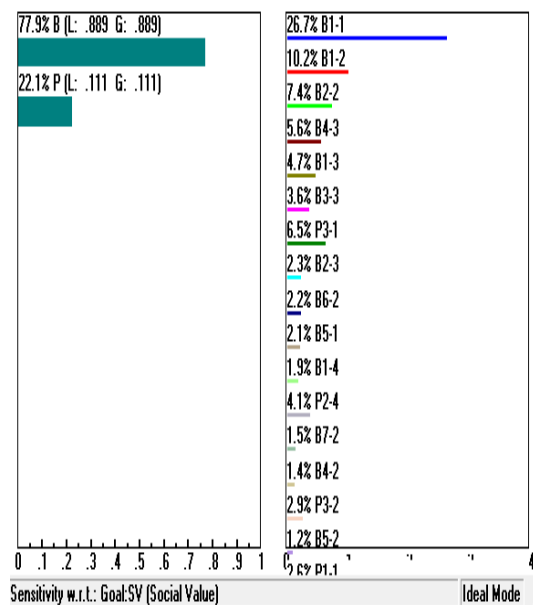


Figure 7 Simulation 2

Figure 8 shows how each indicator changes when the weights of ‘characteristics of the project’ and ‘beneficiary characteristics’ are made the same, in other words, when the ‘project nature’ weight is made the same as the ‘beneficiary characteristic’ weight. It can be seen that even if the weights of ‘beneficiary characteristics’ and ‘characteristic of the business’ become the same, the weight of the Lowest Class (the Basic Livelihood Beneficiary Index) (B1-1), which belongs to the economic status, remains the highest. In other words, it may be said that the highest social value is generated when welfare projects are provided to recipients pursuing basic livelihoods.

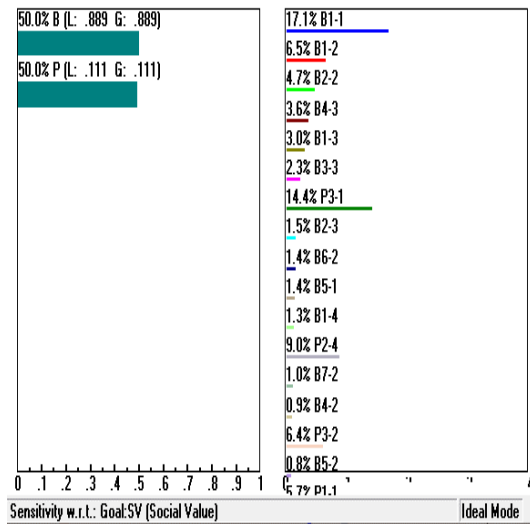


Figure 8 Simulation 3

## 4.2 Application to social value measurement

### 4.2.1 General application method

As the above analysis shows, when relative weights between items constituting social value are created, how to use them for actual business analysis is really important (Albarracín Vanoy, 2022; Ferrer-Benítez, 2023; Kramer & Porter, 2011; Hanemann et al., 2011; Hanemann and Kanninen, 1999; Jha et al., 2022; Centre for Public Scrutiny(CfPS), 2021; Murthygowda et al., 2022; Carson, 1985; Cameron and Quiggin, 1994).

As described above, the relative weight between items constituting social value may vary depending on who participates in the measurement. This is because it depends on subjective evaluation. In other words, local authorities or administrative agencies that wish to apply this method do not need to use a uniform weight; instead, individual organizations can set various weights for each item according to their circumstances.

The weights of the items set in this way can be utilized as follows. In general, administrative agencies dealing with policies or projects need to compare the social value of a plurality of projects (Andrew, 2021; Anticona Valderrama et al., 2023; Brighton & Hove City Council, 2021; Martínez-Líbano et al., 2023; Sánchez Castellanos & Saiz Aldana, 2022). For example, suppose there are two businesses, A and B. It is assumed that Project A is a project to expand a library in a certain area, and Project B is a project for promoting health management of the elderly. Project A assumes that, by its nature, its beneficiaries are young women, mostly unemployed people. By contrast, Project B assumes that most of its beneficiaries are elderly, and that the male and female ratios are similar. At the same time, in terms of method of delivery, it is assumed that Business A uses a voucher method while Business B is an interpersonal service.

Of course, neither business depends on only one method in terms of delivery, and in some instances multiple

business methods are applied. For example, 80 per cent of the total business may be carried out by the voucher method and the remaining 20 per cent by the cash method. Conversely, in a specific business, 95 per cent of business may be performed through personal service and the remaining 5 per cent may be executed via the voucher method. In this case, the overall scale of the project should be classified by category, and the weight set for each category should be multiplied by the percentage of the project weight for each category.

### 4.2.2 Application method using examples

Let us assume that Project A and Project B are placed in front of policymakers for comparative evaluation of social values. The first thing they must do is establish the size (amount) of each business. This can usually be done easily. Next, for each project, the characteristic value is set as a ratio according to the characteristics of the beneficiaries and the detailed indicators constituting the characteristics of the project. For example, if Project A is implemented, and if all its beneficiaries are recipients with basic livelihoods, 100 per cent of these basic livelihood recipients will be beneficiaries. If, on the other hand, 60 per cent of the beneficiaries of the project are basic livelihood recipients, 20 per cent are of the second-middle class and 20 per cent are of the median, and the project is executed, this distribution ratio will be used to calculate the amount allocated to each beneficiary.

In the same way, whether or not a beneficiary of the project is a disabled person can be taken into account in the index for the disabled item, and the distribution ratio of the project relative to the index for the disabled can be derived. Likewise, it is applied also to the ‘characteristic of the project’ indicator and to all indicators, and the final overall weight of the project is derived. In the case of Business B this logic is applied in the same way. When the total social values of Projects A and B are compared with each other through this process, alternative comparisons based on social value can be made.

## 5. Conclusion

This study has aimed at suggesting an easy way to measure the social value of social policies and businesses. Basically: the logic of Input-Output (I-O) Analysis, which is used to analyse the economic ripple effect of a business, was to be applied to the analysis of the social value ripple effect. However, since I-O analysis is a massive task involving numerous experts and much financial cost and time, it is almost impossible to apply the logic of this method to social valuation analysis as it currently stands. If the same logic as in I-O analysis is applied, individual social projects should also be able to derive coefficients such as the employment inducement coefficient, the value added inducement coefficient and the production inducement coefficient. However, as described above, this work cannot be done at the level of individual research.

Therefore, this study attempted to introduce a supplementary weight analysis method, the AHP method. Although this analysis method is theoretical, it itself needs to be supplemented a great deal. For example, the selection and classification system for each evaluation target to be included in the second, third and fourth layers should be accompanied by complementary research. Nevertheless, it is hoped that this study will prove a pioneering study that can be used to estimate social value for each individual business. It is expected that numerous follow-up studies will be conducted in the future so as to further advance research in this field.

### Acknowledgements.

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