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Research Article

Measurement of Level of Trust in Building Social Capital among Water Users Association through Analytical Hierarchy Process

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ABSTRACT

This study aims about constructing social capital through level of trust of the identified stakeholders in watershed context by using analytic hierarchy process (AHP). It was introduced by Satty (1988), for decision making by constructing every complex elements involved in the process in Analytic hierarchy form. The measurement was done through pairwise comparison of the judgements of experts. The empirical findings indicate that among the four stakeholders, the WUA was assigned with the high level of trust followed by the facilitators of NGO, officials of NABARD, officials of DPAP.

Keywords: *Level of trust, WUA (Water Users Association) and Pairwise comparison.*

INTRODUCTION

Trust is the one of the important components of social capital that emerged from the interactions between members within the organization and interaction of members with the outside the organizations otherwise known as stakeholders through established cooperation by Quianhong Fu (2004). In order for people to cooperate to achieve their goals, they need not only to know one another, but also to trust each other so that they will not exploit or cheat in their relationship, and can expect truly to benefit from their cooperation by Field (2003). In this context, trust in building social capital emerged from cooperation of stakeholders in water users associations was studied to enhance the productive potential by Costigan (1988).

MATERIALS AND METHODS

The analytic hierarchy process (AHP), introduced by Saaty (1988), was known as a multi-criteria decision-analysis method was employed. It is widely applied in outstanding works of various fields relating to best option selection, conflict solution, resource allocation and optimization of the decision-making process by Khwanruthai (2012). In this study, the AHP is employed to establish contribution of the elements in building level of trust through the steps given below.

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1. Hierarchy construction
2. Developing a pairwise comparison matrix for each criterion
3. Normalizing the resulting matrix
4. Averaging the values in each row to get the corresponding rating

1. Hierarchy construction

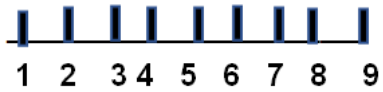
Hierarchy is established by breaking down the overall goal that is building up of level of trust through basic elements. The review of literature and authors' critical judgments has led to the suggestion of the hierarchical model consisting of four elements as depicted in the diagram 1.

2. Developing a pairwise comparison matrix for each criterion

The weight score of pairwise comparison was assigned with a scale of 1-9 as depicted below.

Two items are equally important

One item is extremely favoured to another



Here, the weightage score assigned by the different experts are pooled together and average score of pairwise was worked out. The pairwise score were depicted in the matrix format

$$\text{Matrix of pair wise element} = \begin{bmatrix} C_{11} C_{12} C_{13} \\ C_{21} C_{22} C_{23} \\ C_{31} C_{32} C_{33} \\ C_{41} C_{42} C_{43} \\ C_{51} C_{52} C_{53} \\ C_{61} C_{62} C_{63} \end{bmatrix}$$

Sum the values in each column of the pair wise matrix $= \sum_{i=1}^{n} C_{ij}$

3. Normalizing the resulting matrix

To get the overall importance of one element over another element was worked out for average score of pairwise items in normalized matrix. To generate a normalise pairwise matrix that each element in the matrix was divided by its column total.

$$x_{ij} = \frac{C_{ij}}{\sum_{i=1}^{n} C_{ij}}$$

4. Averaging the values in each row to get the corresponding rating

The sum of the normalized column of matrix was divided by the number of criteria used to generate weighted matrix. Moreover, this average score gives the percentage contribution of particular element towards the goal.

$$w_{ij} = \frac{\sum_{j=1}^{n} x_{ij}}{n} \quad \begin{bmatrix} W_{11} \\ W_{12} \\ W_{13} \end{bmatrix}$$

RESULT AND DISCUSSION

1. Hierarchy construction

Researcher in the behavioural sciences reported that structure, linkage and cognitive factors are the elements of the trust. In this background, the structures that support watershed development activities such as members of water users associations, facilitators of NGOs, officials of NABARD and officials of DPAP were identified. The linkage of members of water users association with in their own domain (Binding capital) and outside domain (Bridging capital) was framed. The cognitive elements as perceived by the respondents such as competence, compatibility, accessibility and transparency that paved the way for the interactions also identified. An analytical hierarchical setup was build up by connecting the structure, linkage and cognitive elements which is presented in the diagram 1.

2. Developing a pairwise comparison matrix for each criterion

The structure and components of trust arranged in hierarchy construction was rated through pairwise comparison. To get the pairwise matrix 20 judges, who are experts in the field of group dynamics in watershed association were employed. The pairwise comparison of trust level on different stakeholders and the elements like competence, compatibility, accessibility and transparency was worked out based on the continuum of 1-9 as proposed by the satty (1988). To build up the pairwise matrix the mean value of the scores assigned by the different judges are depicted in the following table.

Table 1a. Mean score for the trust level of stakeholders based on judges rating

S.No	Sub components	Members of WUA	Facilitators of NGO	Officials of NABARD	Officials of DPAP
1.	Members of WUA	1.000	1.250	1.250	1.500
2.	Facilitators of NGO	0.800	1.000	1.250	1.250
3.	Officials of NABARD	0.800	0.800	1.000	1.500
4.	Officials of DPAP	0.667	0.800	0.667	1.000
Total		3.267	3.850	4.167	5.250

Table 1b. Mean score for components that build up the trust of stakeholders

S.No	Members of Water users association	Competence	Compatibility	Accessibility	Transparency
1.	Competence	1.000	0.667	0.444	0.667
2.	Compatibility	1.500	1.000	0.667	1.250
3.	Accessibility	2.250	1.500	1.000	2.000
4.	Transparency	1.500	0.800	0.500	1.000
Total		6.250	3.967	2.611	4.917
Facilitators of Non-governmental organizations					
1.	Competence	1.000	0.444	0.444	0.500
2.	Compatibility	2.250	1.000	2.000	2.250
3.	Accessibility	2.250	0.500	1.000	2.000
4.	Transparency	2.000	0.444	0.500	1.000
Total		7.500	2.389	3.944	5.750
Officials of NABARD					
1.	Competence	1.000	1.250	1.250	1.500
2.	Compatibility	0.800	1.000	1.250	1.500
3.	Accessibility	0.800	0.800	1.000	1.250
4.	Transparency	0.667	0.667	0.800	1.000
Total		3.267	3.717	4.300	5.250
Officials of DPAP					
1.	Competence	1.000	1.250	1.250	1.250
2.	Compatibility	0.800	1.000	1.250	1.250
3.	Accessibility	0.800	0.800	1.000	1.500
4.	Transparency	0.800	0.800	0.667	1.000
Total		3.400	3.850	4.167	5.000

Further, normalization of above table was worked out to derive average value.

Table 2a. Normalization matrix for the trust level of stakeholders

S.No	Sub components	Members of WUA	Facilitators of NGO	Officials of NABARD	Officials of DPAP	Average
1	Members of WUA	0.306	0.324	0.300	0.286	0.304
2	Facilitators of NGO	0.245	0.260	0.300	0.238	0.261
3	Officials of NABARD	0.245	0.208	0.240	0.286	0.245
4	Officials of DPAP	0.204	0.208	0.160	0.190	0.190
Total		1.000	1.000	1.000	1.000	1.000

Table 2b. Normalization matrix for the trust level of components

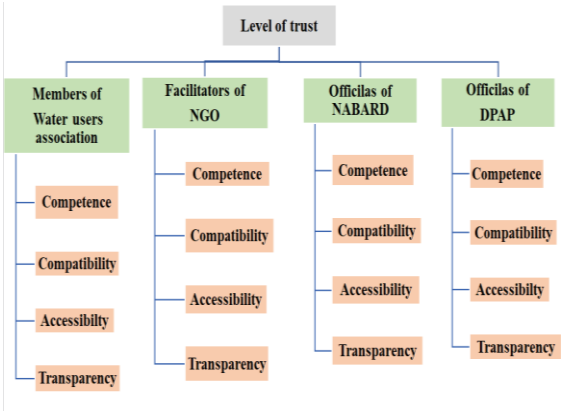
S.No	Members of Water users association	Competence	Compatibility	Accessibility	Transparency	Average
1.	Competence	0.160	0.168	0.171	0.136	0.158
2.	Compatibility	0.240	0.252	0.255	0.254	0.251
3.	Accessibility	0.360	0.378	0.383	0.407	0.382
4.	Transparency	0.240	0.202	0.191	0.203	0.209
Total		1.000	1.000	1.000	1.000	1.000
Facilitators of Non-Governmental organizations						
1.	Competence	0.133	0.186	0.113	0.087	0.130
2.	Compatibility	0.300	0.419	0.506	0.391	0.404
3.	Accessibility	0.300	0.209	0.254	0.348	0.278
4.	Transparency	0.267	0.186	0.127	0.174	0.188
Total		1.000	1.000	1.000	1.000	1.000
Officials of NABARD						
1.	Competence	0.306	0.336	0.290	0.286	0.305
2.	Compatibility	0.245	0.269	0.291	0.286	0.273
3.	Accessibility	0.245	0.216	0.233	0.238	0.232
4.	Transparency	0.204	0.179	0.186	0.190	0.190
Total		**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
Officials of DPAP						
1.	Competence	0.295	0.324	0.300	0.250	0.292
2.	Compatibility	0.235	0.260	0.300	0.250	0.261
3.	Accessibility	0.235	0.208	0.240	0.300	0.246
4.	Transparency	0.235	0.208	0.160	0.200	0.201
Total		**1.000**	**1.000**	**1.000**	**1.000**	**1.000**

Based on the average value the hierarchical flowchart is prepared and presented in diagram 2.

From the table 2a, it could be observed that among the stakeholders, experts assigned high score to members of WUA is (0.304) followed by facilitators of NGO (0.261) and officials of NABARD (0.245) in building trust.

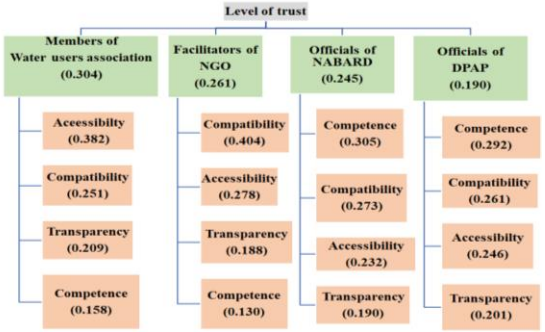
It could be observed from the table that 2b, level of trust among the members of water users association, the accessibility was assigned with high score of 0.382 and other element like competence was assigned with low 0.158 towards building up of trust on water users association. The reason might be that the members of water users association are homogenous in social cultural condition. The members were not counting the fellow members as technically competent, is the reason that competence was assigned with low score in building trust. The level of trust on facilitators of NGO, the compatibility was assigned with high weightage of 0.404. The reason might be the NABARD water users associations due to their frequent interaction with the facilitator of NGO, judges assigned more score than other elements. The level of trust on officials of NABARD and DPAP in building level of trust, the competence was assigned with high score of 0.305 and 0.292 respectively. It is being noted that the officials are trusted for their technical and administrative competence followed by compatibility and accessibility. The transparency of nature of officials to building the trust was found to be low.

Hierarchy construction - (Diagram 1.)



WUA- water users association
NGO- Non-governmental organization
NABARD- National Bank for Agriculture and Rural Development
DPAP- Drought Prone Areas Programme

Building of level of trust as per the judges rating (Diagram 2.)



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CONCLUSION

The bonding capital was assigned with high score in building up of trust by the judges. Accessibility and compatibility was the major reasons for trust on members of WUA and facilitators of NGO respectively. Competence on officials of NABARD and DPAP was assigned with high score. Transparency was assigned with low score in building trust.

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