Causal Loop Study of Benefits of Social Membership Gain of Women through SHG and Validation of Respondents through Fuzzy Shapely Value Analysis

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Abstract: While the impetus of forming Self Help Group (SHG) is economic, women have realized that the social benefits they derive from group membership are as important as the financial ones. This study establishes the causal loop relationship between the social memberships women derive from group membership. Also, a fuzzy shapely value analysis has been done on the questionnaire instrument. This paper also contributes to explain new concepts of solutions for n-persons fuzzy games, defined by the 'Shapley value' in the case of the n-persons fuzzy games. This consistency verification for the n-persons fuzzy game has been applied to this questionnaire analysis to demonstrate the validity of the responses.

1. Introduction

Self Help Groups are small voluntary associations of rural people, preferably women folk from the same socio-economic background. They come together for the purpose of solving the common problems through self-help and mutual help in the Self Help Groups [1].

S.Rajamohan et al [2] in this study "opinion of the members of self-help groups reveals that Self Help Group helps them to increase their status and aids to raise the standard of living of them. Women are becoming entrepreneurs with the help of Self Help Groups which avoids the exploitation of women and helps empowering them.

B.Vijayachandra Pillai and V.Harikumar [3]. In their research "SHGs is highly relevant to make the people of below poverty line " says the very existence of SHGs is highly relevant to make the people of below poverty line hopeful and self-reliant. SHGs enable to increase their income improve their standard of living and status in society to the main stream ultimately, the nation reaps the advantages of socialism.

The SHGs have been recognized as useful tool to help the poor and as an alternative mechanism to meet the urgent credit needs of poor through thrift mentioned by N. Thalavai Pillai and S. Nadarajan [4].

1.1 Fuzzy Shapely Analysis

Inexact information such as human behavior and cognition could be properly analyzed and clarified by applying fuzzy theory. Hence, this research present an analysis method of the opinion survey by applying fuzzy graph and also illustrate its practical effectiveness with our case study. There are some situations where some players do not fully participate in a coalition, but to a certain degree. In this situation, a coalition is called a fuzzy coalition, which is formed by some players with partial participations (that is, the player offers a part of resource that he owns). The Shapley function for fuzzy games is studied by [5] and introduced a simplified expression of the Shapley value for fuzzy games, which can be applied to all kinds of fuzzy games [6-10].

2. Results and Discussions

2.1. Causal Loop Analysis

A model attempt to examine whether there is any association between the growth of Self Help Groups and the increase in female bank deposits and ultimately increase the economic growth of our nation. Leadership experience in Self Help Groups would also improve an individual banking habits and empower women to increase individual banking and henceforth the economic empowerment of nation. This conceptualization is modeled using Vensim PLE

software and the causal loop diagram is given in Fig 1 below. Later in section 3.2, this has been validated by our questionnaire study.
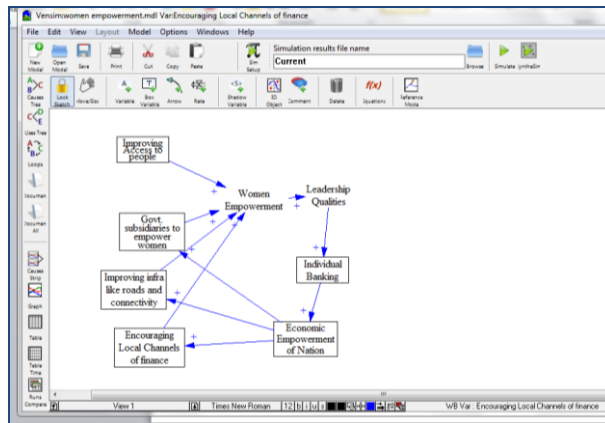

Figure 1. Causal loop diagram of Women empowerment leading to Economic empowerment.

2.2. Results of Questionnaire Analysis

The questionnaire instrument was circulated to about 600 respondents and the opinions were surveyed. The demographic analysis of their profile and empowerment analysis illustrated the following:

  i.   Most of the SHG members are below 30 years and between 35-40 years of age.
 ii.   Nearly 90% of respondents were married.
iii.   Nearly 48% of them were housewives.
 iv.   Nearly 50% of members devote their 50-75% of time to these activities.
  v.   Most of SHG were performing well.
 vi.   The % of profit made by SHG members are given in Table 1 below:

Table 1. Profit made by SHG members

Year	% of Profit
I Year	31.16
II Year	35.13
III Year	38.62

  vii. It is also evident that the capacity utilization is not much, yet the profit margin is on the higher side. This is understood from the Figure2.
 viii. Hence, the hypothesis stated in Causal loop modeling shown in Figure 1 has been validated, since the individual profit % made by women SHG member thus leads to overall improvement of GDP of nation inherently.
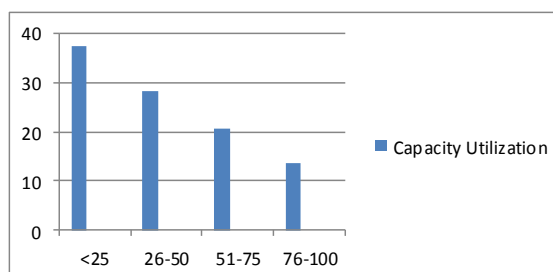

Figure 2. Capacity Utilization

2.3. Fuzzy Analysis for Validating Opinion Survey

The preference structure concerning the subjects by applying the fuzzy clustering's and the fuzzy orderings, which is based on the data of the simple questionnaire given in Annexure 1 is analyzed. Since, the aim of the study was focused on proper identification of whether group membership improves social membership, the factors with very less mean scores were selected for correctness of survey opinion. Those questions (1,5,9,10) with relatively less mean scores contributing towards the fear cluster were subjected to fuzzy analysis. Shapley Value is an alternative way of measuring the relative importance of variables in a regression model. It is similar in concept to the net effects and can be thought of as a more robust estimate of those net effects. Instead of calculating the net effects from the β coefficients and the correlation matrix, we can use the Shapley Value estimates as the net effects (NEi) and solve for the βs. This is a non-linear system of equations but it can be solved with any non-linear solver routine.

$$NEi = \beta^2 i + \sum_{j=i} \beta i \, Rij \, \beta j$$

2.4. Results of Fuzzy Shapely Value Analysis

If we apply the Shapley Value regression procedure we get the following results. The prominent results are listed below and others are neglected.

Table 1: Results of Shapely value regression

QI	βs	NE	% Contribution
1	0.22	0.16	26.3
5	0.07	0.04	6.7
9	0.30	0.034	31.3
10	0.05	0.08	10.5

Hence, it is evident to group the factors (questions) 1 and 9 are the important factors of fear to retard the SHG group from becoming entrepreneurs.

3. Conclusion

The study was undertaken to identify women empowerment through Self Help Group. It is found that the socio-economic factor has been changed after joining the Self Help Groups. But the saving is increasing at earlier stage of life. There are emerging issues that need to be addressed to make the role of women in the long run. The causal loop study has concluded that the economic activities of Self Help Group are quite successful. A questionnaire instrument has been designed and validated using Fuzzy shapely value in a way to study what factors have major impact on retarding the SHG group from becoming entrepreneurs. If actions are implemented to overcome these threats, in this way Self Help Group it is easy to achieve women empowerment in rural areas.

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