

Construction of the "Multi-actor Collaborative Operation" Model for Community Practice Bases from the Perspective of Applied Sociology

Jia Hao*

University of Sanya, Sanya, 57200, China

*Corresponding author: estherjiajia01@163.com

Abstract: *There are many actors at the bottom of community action, and thus coordination costs and conflicts are frequent; however, most previous studies have only used one theoretical lens. Field theory, social network theory and the reciprocal norm framework are combined in this paper to study the structural origin, mode of interaction and evolution logic of collaborative operation. The foundation of the cooperation is the positions and capital of the parties; the strength of this relationship will determine how efficiently resources are used, and mutual norms will regulate the rules for joint operation. All the different kinds of people are in a hierarchy and work together to achieve a common goal. Reputation constraints and supervision games promote the stability of cooperation in trust transmission, and equilibrium adjustment under asymmetric dependence reduces distribution conflicts. Rule redundancy does not increase entropy, and the hierarchical coupling of resource-sharing platforms fosters the blurring of boundaries. A Threshold for self-organisation is an evolutionary signal of regime change. The whole framework of the analysis of multi-actor cooperative operation is shown above.*

Keywords: *Applied Sociology, Collaborative Operation, Field Theory, Social Network, Reciprocal Norm, Institutional Elasticity*

Introduction

There are many coordination costs and conflict risks in the collaborative area of community action due to differences in capital endowment, decision-making logic and frequency of action for resource sharing and task cooperation among all parties. Previous studies have focused on field position analysis, some have paid more attention to the emotional aspects of network relationships, others have remained at the level of abstract discussion of exchange norms, and they have not yet built a comprehensive system by integrating the above theoretical resources to explain the construction of collaborative operation models. The deficiencies mentioned above are not the only reasons for collaborative orders among all parties, and therefore they have little explanatory power in actual collaborative circumstances. Applied sociology will be employed, and the lenses of field theory, social network theory and reciprocal norms will be used to study the structural origins, modes of interaction and institutional elasticity of the problem in this paper. See how all sides can continue to cooperate according to their own rules, spread trust and share resources without the pressure of external forces. This paper will add to the system of collaborative theories and offer some general analytical tools for the design of other kinds of collaborative spaces.

1. Theoretical Foundation of Applied Sociology and the Analytical Approach to Collaborative Operation

1.1 Positioning Differentiation and Actor Capital Allocation in Field Theory

Based on the analysis framework of applied sociology, the foundation of community action can be regarded as a changing relational space formed by many people in all kinds of positions. Based on how much economic capital, cultural capital and social capital are available at different times for various parties, a position system with both vertical differentiation and horizontal division of labour is set up at the base. Actors with rich economic capital are generally the first to invest in material resources; those with excellent cultural capital lead the way in building systems for the spread and application of

knowledge; and those with broad social capital can carry out cross-border bridging. The differentiation of positions is not fixed in time and changes constantly due to capital exchange and rank competition in the course of cooperation^[1].

The Division of capital among the parties will be in line with the internal logic and access rules of that area. The allocation of funds is not fixed; according to the demands of the business, different kinds of funds should be given different weights. At the level of operation of a community action base, resource allocation refers to the distribution of physical assets and the mutual recognition and accumulation of symbolic capital by all parties. All the subjects hope to achieve a relatively good structural position by using all sorts of combinations of capital, and at the same time, they are adjusting their own capital investments through exchanges and games with other subjects. Therefore, there will be a relatively even but still uneven distribution of capital flows, and a structure for cooperation can be established.

1.2 The Connectivity Logic of Relationship Strength from the Perspective of Social Network Theory

According to the idea of social network theory, the actions of all people in the community action base are not independent but are connected in networks of strong ties and weak ties. Strong ties refer to frequent contact with people one is close to emotionally and many other connections. Most of the links among the parties are due to capital reserves and functional positions, and they serve to spread trust and share tacit knowledge. Weak ties have little contact and are associated with only one obligation. They are at different levels and have different purposes, so they will carry various kinds of information and have limited capacity. The two kinds of relationships have different strengths and weaknesses, so they can be combined to meet all kinds of demands.

The Linkage Logic of the relationship strength will affect the economy and stability of resource mobilisation in joint operations. If the foundation is in good relations with the network of strong ties, then coordination of action can be achieved promptly by invoking reciprocal obligations. When faced with an unknown situation or a problem that cannot be solved, weak ties are the first to be contacted for new information and ideas. Actors can choose to turn on or off all kinds of relationship links according to the demands of their work and their sense of risk. Given that there is a high degree of interconnectedness, a fluctuating selection method will be used to avoid an overly uniform network and maintain a certain level of openness in the foundation of collaborative trust by making some exceptions.

1.3 The Formation of Collective Action Order by Norms of Reciprocal Exchange

As a type of regulation that arises from social interaction, the norm of reciprocity can help maintain order in the course of many-party cooperation and achieve the common goals of the community. It is not an equal exchange in the market or obedience to an order in a hierarchical system; rather, it is a reciprocal norm that requires the participants to pay a smaller amount now in exchange for a higher rate of return over a series of future deals. After many rounds of discussion, the norm above has been adopted to reduce the problem of asymmetric expectations caused by actor heterogeneity. All contact is about obtaining resources, and it is also a way to present oneself and form an identity for the self^[2].

Prolonged observation of the reciprocal norm in interactions promotes the spontaneous order of collective action, and the binding force is not external coercion but rather the positive expectations actors have of net gains from continuous cooperation. Therefore, behaviour that does not meet the norm of reciprocity will be both harmful to one's reputation and excluded from the social circle; thus, there will be increased psychological pressure for opportunistic behaviour. At the same time, the reciprocal norm is also a non-zero-sum way to address distribution conflicts; that is, one does not seek absolute fairness in a single exchange but rather aims for overall balance in the sequence of exchanges. The normal mode is in the form of a space, so it has a small friction coefficient and is self-healing under the condition of severe resource distribution asymmetry.

2. Structural Generation and Interaction Mechanism of Multi-Actor Collaborative Operation

2.1 Heterogeneous Characteristics of Actors and Functional Complementarity in Hierarchical Nesting

Actors in cooperative operations have different endowments of resources, rationales for decision-making and speeds of action. The differences should not be corrected but are to be used as the

basis for division of labour. Actors with a large amount of economic capital are more likely to act in a cost-benefit manner; those with strong cultural capital will give more weight to the soundness of the knowledge system and legitimacy of symbolic evaluation; and those with rich social capital will be more eager to maintain relationships and engage in cross-border mediation. The three types of action logic in the basic form are multi-axis decision-making centres and are not the same as those in a single organisation. As the attributes are not directly comparable, there is a division of labour; that is, different parties carry out various, complementary tasks according to their own strengths and avoid the waste of joint resources caused by uniform competition.

Functional complementation has been achieved through the nesting of the form of the organisation hierarchy, and each level has an essential integration function. The lowest is to gather information and make daily operational decisions; in the middle is to coordinate all departments in the organisation and allocate resources; and at the top is conflict resolution and rule modification. The links at all levels are not simple command lines; rather, they are dynamic connections that have been formed by means of the feedback loop of two-way penetration. Filter the uncertain signals at the lower level with information filtering, and then pass them to the upper level for resource distribution according to the regulatory rules at the top. The structure above will not lead to disorder in the functional cooperation of these units, and it will be organised reasonably according to a clear division of labour.

2.2 Reputation Constraints and Supervision Games in the Trust Transmission Path

There is no trust at the start of the multi-party cooperation, and it will be gradually established through regular contact at all times. Actors first form indirect trust judgments based on the behaviour of the other party in past third-party relationships; that is to say, trust is spread from known, trustworthy people to unknown, new people at the periphery of the social network. Transmission efficiency is related to network connectivity; that is, if there are many common contacts between the two parties, the attenuation coefficient of trust transmission will be relatively small. After building trust at the local level, it will spread to other places in a chain and gradually form a whole-community trust network.

The two guarantees for the continuity of trust are the reputation constraint mechanism and the supervision game. Reputation can be regarded as an organised collection of trust; that is to say, it is a record of a person's trustworthy or untrustworthy behaviour in previous interactions with others. Those who do not meet the reciprocal norm will lose the respect of others and will be less likely to be chosen as cooperation partners in the future. It will be a weak deterrent then. At the same time, there are no monitoring devices or formal inspections of the supervision game; rather, it is part of the mutual observation behaviour in daily life. Each actor is both the supervised party and the supervisor, so the harm caused by any deviation from their will will be reduced because it will be monitored by others. Multilateral mutual supervision can spread the supervision costs among several supervisors, and thus it will be difficult for opportunistic behaviour to go unnoticed by the whole system^[3].

2.3 Asymmetric Dependence in Benefit Distribution and Equilibrium Adjustment Strategies

The degree of dependence on the resources of other parties in the collaborative operation is not uniform, and this uneven distribution is one of the reasons for conflict over the division of benefits. One actor is highly dependent on a scarce resource provided by another party, but the latter has weak reverse dependence on the former; thus, there is a large gap in the dependence gradient. Actors who are highly dependent on their work have little bargaining power in distribution negotiations and are more likely to accept an unfavourable distribution plan in order to ensure an uninterrupted supply of resources. Low-dependence actors have more freedom of action and are therefore more likely to obtain favourable terms in the negotiation of distribution rules. If the pattern of asymmetric dependence continues for a long time, the original reason for the weaker side's participation in cooperation will be lost, and thus, there will be fragmentation of the network.

The two main ways to correct for asymmetric dependence are the following two paths. The first is that the weaker party can actively seek other sources of funds and reduce its dependence on the stronger party. With the spread of all kinds of switches, the first-offenders are no longer limited to the original distribution channel and have gained some bargaining power. The second is that the stronger party can proactively add delayed-payment or other intertemporal adjustment clauses to the distribution plan and forego short-term profits in order to maintain good long-term cooperative relations. Although this is not the best way to distribute, we will still be able to conduct other exchanges in the future. Alternatively, the two types of adjustment strategies can be employed to have the distribution

equilibrium point move in line with changes in the dependence structure and not be fixed at a single ratio. After the process of rolling equilibrium, the exit rate is small and the distribution satisfaction is at a moderate level.

3. Institutional Elasticity and Evolutionary Trend of the Collaborative Operation Model

3.1 The Negative Entropy Effect of Rule Redundancy Design on Conflict Mitigation

Rule redundancy in the institutional arrangement of collaborative operation refers to the creation of several alternative processing paths or verification nodes for the same kind of task and the failure to choose the most suitable one. The above inefficient Design is actually a conflict buffer. When many people cannot agree on a choice because of different locations, rule redundancy can offer other ways to act and thus avoid a deadlock in one place. There are many ways to do so; if one is blocked, the whole operation will not stop, but rather the conflict energy will be gradually released through diversion channels and will not accumulate in the centre. Redundant Design is also difficult to change for a single party because many parallel nodes need to be modified at the same time, so the cost of opportunistic behaviour is greatly increased^[4].

According to the system information theory, the response of rule redundancy to conflict signals is a type of negative entropy input. Generally speaking, a conflict is caused by an increase in the uncertainty of the system; that is, there is a rapid increase in information entropy. Redundant rules change the type of conflict from a difference in values to a technical problem of path selection by providing several ways to achieve the same goal. Translation will reduce the cognitive load of the system and enable all parties to agree on the rules and exercise control. Many of the calibration points obtained by means of redundancy continuously absorb small deviation signals in normal operation and do not accumulate significantly. A negative entropy effect can help the collaborative system operate normally for a longer time without the need for external intervention, and conflict is no longer considered a defect that needs to be corrected; rather, it is a type of normal feedback that triggers a switch to backup rules.

3.2 Hierarchical Coupling of Resource Sharing Platforms and Boundary Blurring

The resource-sharing platform will be a place where all sides can exchange material and non-material codes, and it will be based on a hierarchical coupling assembly logic. At the lowest level of coupling, each actor only shares annotated content at the information level, such as resource inventories and schedulable time slots, and the resources themselves are still in the sovereign area of each actor. At this time, a pool of substitute resources has been created by actors in a certain area through sharing. Obtain the owner of the resource and cross-access will also be supported. At the top level of the platform, resources are represented symbolically; that is to say, each actor trades the right to use its own resources for the right to use others' resources, and the standard for this trade is set by the platform's internal conversion rules and not by the unilateral pricing of any single actor. The three stages are in sequence, and one should learn the current stage before moving on to the next.

As more people join, the old division among the parties will gradually disappear. Accessing resources no longer needs to be approved every time; instead, it will be based on the trust credit accumulated over a long period, and the old division between resource ownership and resource use will also be eliminated. There are two kinds of boundary blurring: horizontally, the overlap of functional areas by different actors has been increasing; and operations that were once under the control of a single party are now being cross-intervened upon by many parties. Vertically, the distance between the decision-making authority and the implementation has been shortened; now, judgments on resource access are made directly at the local level and do not need to go through many levels of approval. This diffusion should not be considered disorder; rather, it is a new type of order rule that is open to the world. The efficiency of resource sharing is no longer determined by the total quantity of resources, but rather by the length of the access chain and how many consensus thresholds need to be met before it can be used. Gradual linkage is a kind of boundary blurring that does not create a vacuum in rights and obligations due to excessive blurring.

3.3 Threshold Determination for Mode Replacement in the Self-Organized Critical State

After a long time, the collaboration model has moved closer to a state of self-organisation and

criticality; it is the boundary limit of the system that can withstand local fluctuations without changing the general structure. At this time, there will be no more daily conflicts or shortages of resources in the old system, and it will continue to operate normally despite changes in the outside world. The first characteristic of a critical state is that the magnitude of the perturbations is distributed according to a power law; that is, small disturbances are frequent and large-scale changes are rare. As shown in the distribution above, all permutations and combinations of the rules have been employed by the system. If the disturbances continue to accumulate and the size distribution does not follow a power-law curve, it can be concluded that the current operating model has reached the upper limit of its regulation capacity, and fine-tuning will not solve the new problems either.

The upper limit of the transition to the other state is set by self-organisation near a critical point. According to the three observable indicators for the threshold, they are: the mean length of the conflict escalation chain, the number of communication rounds required for cross-actor coordination, and the proportion of unused redundant resources in the resource-sharing platform. When a conflict spreads from one place to more than half of the people in the first two links of transmission, it is close to reaching a critical point. If the number of rounds of coordination communication exceeds the empirical upper limit and continues to increase, then the threshold will be exceeded. If the excess resources have not been used for a long time and the frequency of conflicts has not decreased, or has even risen, then the conditions for mode replacement have been met. After reaching the critical value, the collaborative operation model is in a short state of instability; at this time, the binding force of the original rules has decreased significantly, and the legitimacy of the new rules has not yet been acknowledged. The mode replacement carried out in this window is not a random jump but a gradual move in the direction of least resistance, and its final form will be limited by the dual factors of path dependence for existing institutions and the pattern of resource distribution.

Conclusion

Based on the theoretical foundation of applied sociology, this paper will systematically introduce the structural conditions, forms of interaction and evolutionary trends of the multi-actor collaborative operation model at the base of community action. Based on the field theory, differentiation of positions and allocation of capital are required for cooperation; according to the social network view, the connectivity logic moderates the effect of strong and weak ties on the efficiency of resource mobilisation; and according to the reciprocal norm, this order of collective action has also emerged spontaneously. Heterogeneity among actors can be turned into cooperative resources by means of functional complementarity and hierarchical nesting; reputation constraints and supervision games in trust transmission promote stability, and equilibrium adjustment strategies for asymmetric dependence reduce distribution friction. Rule redundancy is at the level of institutional elasticity, conflict energy is absorbed by a negative entropy effect, hierarchical coupling of resource-sharing platforms promotes boundary blurring, and a threshold determination for the self-organised critical state provides an observable basis for mode switching. The following three directions will be the subjects of the next research. First, the sensitivity of the parameters in all kinds of areas of the collaborative operation model will be investigated, and then it will be determined whether the analytical framework presented in this paper can be applied to heterogeneous environments. Second, Dynamic simulation and computational modelling will be used to quantify the non-linear characteristics of the path for the transmission of trust and changes in dependence gradients, and thresholds will be established. Thirdly, there will be problems of power structure and symbolic domination in the collaborative operation system; from a critical sociological perspective, this will also be addressed in the explanation of unequal exchange relations among all parties.

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