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ORGANIZATIONAL PROXIMITY, COLLABORATION PROPENSITY, AND COOPERATIVE PERFORMANCES: THE CASE OF COOPERATIVE AGRICULTURAL EXTENSION IN CHINA

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The agricultural extension system in China has been continuously evolving to meet the information needs of farmers. Contemporarily country has adopted an integrated model of outreach known as Cooperative Agricultural Extension (CoAE). This paper provides pioneering evidence by evaluating the cooperative performance in CoAE organizations and their associated factors. By conducting empirical analysis, based on the survey data of 121 CoAE projects in 16 provinces, this study discusses how organizational proximity and collaboration propensity determines the cooperative performance in CoAE. The results show that two dimensions of organizational proximity (attribute logic and cognitive logic) and collaboration propensity have significant positive effects on cooperative performances CoAE. Moreover, the collaboration propensity completely mediates the relationship between the attribute logic dimension of organizational proximity and cooperative performances. Meanwhile, the collaboration propensity partially mediates the relationship between the cognitive logic dimension of organizational proximity and cooperative performance. These findings provide pivotal suggestions in terms of inter-organizational collaboration and the importance of common physical and knowledge resources, which can improve the cooperative performance and efficiency of CoAE in China.
Keywords: Agricultural extension; organizational proximity; collaboration propensity; cooperative performance; China.

INTRODUCTION

Agricultural extension is the primary institution which deals with the farming communities at the grass-root level (Khan *et al.*, 2019). The smooth knowledge dissemination to the farmers is among the primary objectives of agricultural extension. In China, the agricultural extension system has been continuously evolving to meet the information needs of the farming communities (Babu *et al.*, 2015). Contemporarily, as the market-oriented reform continues, a government-dominated unitary multi-linear agricultural technology extension system has been gradually transformed into a new agricultural extension system with multiple agricultural extension organizations (Gao, 2010). The revised law of the People's Republic of China on Agricultural Technology Extension, implemented since 2013, stipulated that agricultural technology extension shall be promoted under the extension system that integrates governmental agricultural technology extension agency with agricultural research institutes, relevant colleges, farmers' specialized cooperatives, ago-related enterprises, mass organizations of science and technology, and peasant technical personnel. This new transformation of the traditional extension system into an integrated extension system is known as "cooperative agricultural extension."

Although this so-called cooperative agricultural extension approach has made a significant improvement in inter-organizational coordination, collaborative expansion, technology transfer, and joint construction of research centers. However, there still exist some problems such as the lack of proper communication and interaction between organizations, ambiguous development orientation leading to the failure in organizational aggregation, which have negatively affected the operational efficiency of the agricultural extension organization system (Gao, 2015). In response to these limitations, theoretical discussions emerged, questioning the structure and mechanism of cooperative agricultural extension. Some of the studies have pointed out certain structural gaps and suggested measures accordingly. For instance, Gao (2009) pointed out that a diversified CoAE system should be built, and he further put forward some suggestions on the relationship between the organization and its environment, inter-organizational interaction and coordination, structural optimization, and managerial improvement of the organization, etc. Similarly, based on the supercycle theory, Zhang (2011) suggested the formulation of

a farmers' demand-oriented, market-based, government-led, and multi-actors interacted collaborative governance mechanism.

Most of these studies are limited to the theoretical discussions regarding the need for the development of a collaboration mechanism. However, scarce literature is existing, which empirically analyzed the practice of the existing cooperative agricultural extension system. Hence there is still a lack of in-depth research that considers cooperation mode of multi-agricultural extension, cooperative performance, and influencing factors. Therefore, considering the rationale, this study is designed to present an empirical analysis of the cooperative agricultural extension system in China. The objectives of the study are 1) to establish the variables of organizational proximity, collaboration propensity, and cooperative performances in the case of CoAE, 2) to explores the relationship between organizational proximity, collaboration propensity, and cooperative performances in CoAE, 3) and to identify the determinants of cooperative performances of CoAE.

This paper is divided into five sections, starting with the introduction as section 1. Section 2 presents the theoretical background and research hypothesis. Section 3 outlines the research methods, while results and discussion are explained in section 4. Lastly, section 5 includes conclusions and suggestions.

Theoretical Background and Research Hypotheses

***Organizational Proximity*:** In simple terms, proximity refers to the same "cluster" or "type" characteristics shared by different actors with different resources in a particular network. This concept was initially considered to be the spatial proximity of different subjects in space, which is equivalent to the concept of geographic proximity. However, with the development of globalization, which gives rise to non-spatial proximity and informatization, which reduces the impact of spatial proximity, some scholars (Kirat and Lung, 1999; Shaw and Gilly, 2000) from the French proximity dynamics school first put forward the idea that proximity contains multiple dimensions and expanded beyond geographic proximity. Kirat and Lung (1999) define organizational proximity and institutional proximity that is particularly important because innovation systems at the regional level rely on commonly shared behavior and perception principles, which come as the result of multi-parties' games and compromises against divergent and conflicting interest. While organizational proximity, on the other hand, emphasizes the importance of the division of labor in an established organization or cooperative agency, where the members could be more likely to exert their advantages. Similarly, Shaw and Gilly (2000) supplement organizational proximity, which includes two logic levels of similarity and dependency. In similarity logic, organizational proximity means that the subject has the same representation and reference space and shares the same knowledge, such as behaviors and conventions. In regard to dependency logic, organization proximity refers to the multi-parties' direct exchange activity, close to the same relationship space such as enterprise, network, etc.

In addition to the proximity of the dynamic school, other scholars have also made some helpful explorations on the dimension division of proximity by further proposing the multiple dimensions such as technical proximity, cognitive proximity, relational proximity, and cultural proximity, etc. For example, Boschma (2005) divides proximity into five dimensions: geographic proximity, organizational proximity, institutional proximity, cognitive proximity, and social proximity. To avoid overlapping dimensions of proximity, Knoben and Oerlemans (2006) divided proximity into three main dimensions: geographical proximity, organizational proximity (including organizational structure proximity, cognitive proximity, institutional proximity, and cultural proximity), and technological proximity. The above two dimensions have exerted an important influence on academic circles.

Based on the practice of cooperative agriculture extension in China, the inter-organizational proximity could be further divided into geographic proximity and organizational proximity. Geographic proximity refers to the spatial proximity of each extension actor, while organizational proximity refers to the number of common attribute logic and cognitive logic as different organizations cooperate. Attributive logic means the inherent organizational resources, organizational structure, behavior norms, conventions, and operational mechanisms, etc. Cognitive logic is a psychological, cognitive system related to organizational resources, institutional rules, knowledge, and technology structure, cultural value, experience, and background, which is based on individual cognition and formed during long-term practice (Gao, 2015). The stronger degree of organizational proximity indicates more attribute logics shared by the organizations, which could facilitate relevant technical knowledge to transfer across organizational boundaries with lower transaction costs. While on the other hand, more inter-organizational cognitive logic means the more similar psychological, cognitive system under which actors from different organizations are more likely to produce similar cognitive behaviors.

Furthermore, the attribute logic dimension of organizational proximity could also be subdivided into organizational resource proximity and organizational structure proximity. Resource proximity refers to the degree of similarity in the amount of the core resources, including financial resources, material resources, human resources, channel resources, while organizational structure proximity refers to a similar degree in the structure such as management ranges, etc. Likewise, the cognitive logic dimension of organizational proximity is subdivided into the organizational relationship proximity and organizational cognitive proximity, where the

previous means that whether the organizations are attached to the common "community of practice," while the latter refers to the degree of inter-organizational similarity in behaviors, values, and prospects.

Collaboration Propensity: Most scholars have not well explained the connotation of collaboration propensity, although the word has a high frequency of use in the field of psychology, management, and other related areas, which also leads to the great arbitrariness of its measurement index. For instance, some scholars employed the two terms "collaboration propensity" and "collaboration" alternatively, that is, to define collaboration propensity with the dichotomy of collaboration and non-collaboration. However, it is not enough to describe the collaboration propensity simply from a single point of view, because in its inner sense, cooperation may not be achieved only with the propensity. Based on literature evidence, the connotation of collaboration varies in a specific situation; for instance, Beaver (2001) considered that one of the important measure dimensions is whether collaboration between organizations can bring useful and important scarce resources (including data, proprietary technology, instrument, and equipment, etc.) to solve the various kinds of further research and development challenges. Birnholtz (2007) indicated the need for consideration of another important dimension in measuring the collaboration propensity among individuals and groups. That is the trust of collaboration between them, which means whether they believe that collaboration contributes to success. Similarly, Wang (2011) argued that the variable of collaboration propensity could be measured from the three important dimensions: willingness, reciprocity, and inclusiveness.

Asa matter of fact, collaboration propensity is an extremely important factor in collaboration. Strong enough collaboration propensity could promote a stable inter-organizational cooperative relationship, which in turn positively influences the cooperative performance. In the practice of agricultural extension in China, most of the agricultural extension work is project-based, for instance, in the case of "Special National Project," where the extension and cooperation are linked within the project. Although different types of extension organizations of China have established a collaborative relationship, despite different considerations, they have not created a well-organized process of cooperation. Hence, a stable cooperation relationship has not been significantly improved. In other words, they lack a strong collaboration propensity.

Based on the two-dimensional structure of collaboration propensity proposed by Birnholtz (2007), this paper extends the connotation into three dimensions: trust, reciprocity, and inclusion from the perspective of the inter-organizational cooperation level. Here, collaborative trust refers to the trust level of partners in collaboration, which mainly includes cognitive trust and emotional trust. Collaborative reciprocity refers to the positive behaviors that help to enhance each other's power and ability, particularly those active and voluntary behaviors in fulfilling the commitment. Collaborative inclusiveness mainly refers to inclusive behavior that the organizations attach importance to their cooperation, especially those behaviors in conflict resolution. Generally, the higher the degree of trust, reciprocity, and inclusiveness depict the stronger organizational collaboration propensity.

Cooperative Performances of CoAE: The academic field has made abundant and productive studies on agricultural technology extension performance. From the perspective of the interaction between farmers and agricultural technology extension personnel, some scholars have built the performance evaluation system of agricultural technology extension (ZHANG et al., 2010; Liao, 2012) while others have constructed the corresponding performance evaluation system from the perspective of extension organization (Fahuan, 2005; Qu, 2011). Previous studies have, however, done little on the performance of cooperative agricultural extension in China. For instance, based on the practice of cooperative agricultural extension in China, Qi-Jie and Yun-Hao (2015) have constructed the performance evaluation index system of cooperative agricultural extension with four criteria including extension input index, extension process index, extension output index, and satisfaction index with 20 sub-indicators. Some studies (Li, 2007; Li, 2011) have pointed out the consideration of indicators such as achievement, relationship continuity, cooperation satisfaction, and innovation ability improvement in order to measure cooperative performance as they are widely used in empirical research.

Cooperative agricultural extension refers to the inter-organizational collaborative network of mutual trust, long-term cooperation, mutual benefit, and continuous improvement and optimization, which is constructed in the process of the diffusion of agricultural innovation. Based on the practice of cooperative agricultural extension in China, the cooperative performance for the case of this study indicates collaborative satisfaction, collaborative extension target achievement, collaborative actors' ability promotion, and collaboration cost reduction.

Organizational Proximity and Collaboration Propensity: The inter-organizational collaboration aims to promote communication and information exchange to generate more interactions and innovations and hence reduces transaction costs. At present, agricultural extension basically means agricultural technology extension, which involves the extension of scientific and technological innovation such as substantial manpower, finance, material resources, and related software and hardware facilities to farmers in rural areas. For the attribute logic dimension of organizational proximity, more attribute logics shared by organizations mean the closer amount of resources such as finance, material, human resources, and channel resources, which would

undoubtedly enhance the inter-organizational collaboration trust, rationalize the role division in collaboration, and help to generate more reciprocal and inclusive behaviors.

From the cognitive logic dimension of organizational proximity, more cognitive logic shared by organizations indicates a higher similarity on backgrounds, targets and values, knowledge, and technology between organizations, which would undoubtedly facilitate communication and ideas exchange between organizations and hence improve the mutual understanding leading to effective collaboration. In this way, the partner organizations could effectively improve mutual understanding, obtain resources, and share knowledge, especially those skills, knowledge, and technology extracted from the practice of agricultural technology extension. In the long run, the interaction between organizations will increase the psychological identity of each other and then produce psychological attachment, which could create a higher-level intensity of the organizational relationship. Under these settings, the inter-organizational collaboration trust, reciprocity, and inclusiveness will get improved apparently. Based on these theoretical foundations of organizational proximity and collaboration propensity, this study constructs the following hypothesis.

Hypothesis 1a: The attribute logic dimension of organizational proximity has a direct and significant positive effect on the inter-organizational collaboration propensity.

Hypothesis 1b: The cognitive logic dimension of organizational proximity has a direct and significant positive effect on the inter-organizational collaboration propensity.

Organizational Proximity and Cooperative Performance of CoAE: Based on the theoretical and empirical analysis, studies have found that inter-organizational multidimensional proximity has an influence on cooperative performance. For example, Hautala (2011) found that cognitive proximity between international R & D organizations significantly affects the interactive knowledge creation that contributes to improving the overall R & D cooperative performance. Mao (2016) found that target cognitive proximity and the competition and cooperation cognitive proximity have positive correlations with the innovation performance of technological alliances. However, these studies mainly focused on the organizational collaboration of IUR (Industry-University-Research) and strategic and technological alliances. While in terms of collaboration of agricultural extension organizations, studies on the relationship between the inter-organizational multidimensional proximity and the cooperative performance still remain relatively unexplored.

In the CoAE, the attribute logic of organizational proximity, on the one hand, refers to similar organizational structure, resource conditions, and similar organizational institutions and culture, which can better promote the "integration" and "internalization" in collaboration and enhance collaboration intensity leading to reduced transaction costs. While on the other hand, similar organizational rules, procedures, and conventions can facilitate active exchange of knowledge, information, and other skills resources, which positively affect cooperative performance in terms of lowering transaction-related costs.

Similarly, the cognitive logic dimension of organizational proximity is based on similar goals, values, unique relationship history, similar knowledge, and technical background. In the context of CoAE, on the one hand, the cognitive dimension can encourage a similar intellectual attitude among the stakeholders, optimize the cooperative governance mechanism, and form a joint force between the organizations, which may result in active cooperation. While on the other hand, enhanced cognitive behavior could establish a well-organized collaboration platform of communication and ideas exchange among the organizations. Through this platform, partners organizations could effectively exchange special cognitive resources such as technical knowledge, indigenous knowledge, and practical skills obtained from the practice of agricultural technology extension. These concepts lead to the following hypotheses.

Hypothesis 2a: The attribute logic dimension of organizational proximity has a direct and significant positive effect on the cooperative performance of cooperative agricultural extension.

***Hypothesis 2b*:** The cognitive logic dimension of organizational proximity has a direct and significant positive effect on the cooperative performance of cooperative agricultural extension.

***Collaboration Propensity and Cooperative Performance of CoAE*:** In the case of CoAE in China, the majority of the partnerships are built through cooperative projects which are loose and unstable. These collaborations are either driven by economic interests or subject to certain mandatory policy requirements. Briefly, in many cases, the lack of integral collaboration propensity results in the lack of collaboration motivation, which brings failure in forming effective organization aggregation. These factors may lead to ineffectiveness in cooperative performance in CoAE. Similar findings have been reported by many Chinese and international scholars indicating the relationship between these variables in many related fields. For example, Wenan and Hong (2006) have proved that trust and commitment among supply chain partners could enhance their willingness to collaborate and thus enhance the overall cooperative performance. Similarly, the empirical study of Xue et al. (2010) on the Industry-University partnership found that inter-organizational collaboration, reciprocity, and inclusiveness play a decisive role in cooperative performance. Overall, the stronger collaboration propensity indicates a higher trust degree, which could encourage organizations to adopt the corresponding reciprocal and inclusive behaviors. Accordingly, it would maintain the established cooperative relationship, form effective organizational aggregation, and

then improve the overall cooperative performance. Therefore, this paper puts forward the following hypothesis.

***Hypothesis 3*:** The collaboration propensity has a direct and remarkably positive effect on the cooperative performance of cooperative agricultural extension.

This study further argues that organizational proximity also affects cooperative performance through the mediating variable of collaboration propensity, as shown in figure 1. Hence the following hypotheses are generated:

***Hypothesis 4a*:** The collaboration propensity mediates the relationship between the attribute logic dimension of organizational proximity and cooperative performances of CoAE.

***Hypothesis 4b*:** The collaboration propensity mediates the relationship between the cognitive logic dimension of organizational proximity and cooperative performances of CoAE.

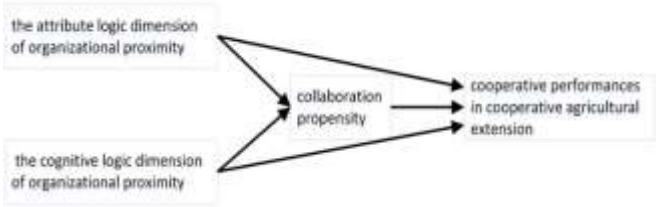

Figure 1 : Mediation relation model

Research Methodology

Samples and Data Collection: The survey was carried out on the cooperative extension projects in which the various extension organizations were involved and participated during the recent years. This paper aimed at the most influential five types of agricultural extension organizations, which are government-run, education-oriented, research-oriented, enterprises-run, and self-service. This study was conducted in 16 out of 23 provinces of China and considered 121 CoAE organizations as a sample for this study; hence all the CoAE projects in China were the population of this study. However, there existed no accurate information about the total number of CoAE projects in the whole country, as each of the 23 provinces has a different mode and type of collaboration among CoAE projects. Therefore, considering the significance, based on the researcher's knowledge of the nature of the research and consultative meetings with various stakeholders, a total of 121 CoAE projects were shortlisted in 16 provinces and were approached for data collection with an effective response rate of 100%. Such a sampling approach is widely adopted in studies involving various types of organizations or institutions working at various levels (Khan et al., 2020). Among the five kinds of CoAE organizations, the sample distribution included government-run 23 (19%), education-oriented 22 (18.2%), research-oriented15 (12.4%), enterprises-run39 (32.2%), and self-service 22 (18.2%). The detailed distribution of the sample with respect to each province is given in Table 1. The data collection was completed between August 2012 and December 2016.

A primary survey questionnaire was used to collect information involving the key informants in charge of different types of extension organizations and their cooperation partners. Data were collected on the pre-selected indicators, i.e., organizational proximity, collaboration propensity, and cooperative performance of the selected agricultural organizations. The questionnaire included two parts: the first part covered the basic information of the chosen extension organizations and cooperative extension projects, while the second part was focused on the subjective measurement of the specific cooperative projects. Table 2 provides the details of indicators and sub-indicators on which data were collected.

***Variable Description and Measurement*:** In terms of study variables, indicators, and sub-indicators, this study subdivided the key indicators of major variables into sub-indicators presented in the form of question statements (Table 3). For instance, the organizational proximity variable was divided into two major indicators, i.e., attribute logic and cognitive logic, which were further divided into five sub-indicators or question statements for each. Similarly, the collaboration propensity variable was mainly measured by four indicators, i.e., cognitive trust, emotional trust, reciprocity, and inclusiveness. The cooperative performance was defined by collaborative satisfaction, collaborative target achievement, collaborative actors' ability improvement, and collaboration cost reduction. A five-level Likert scale, from 1

Table 1. Sample Distribution across the selected provinces.

Provinces	Sample units	percentage	Provinces	Sample units	Percentage
Shandong	30	24.8	Guangdong	28	23.1
Yunnan	14	11.6	Anhui	11	9.1
Beijing	9	7.4	Shanxi	7	5.7
Sichuan	4	3.3	Liaoning	3	2.5
Heilongjiang	3	2.5	Hunan	3	2.5
Hebei	2	1.7	Hubei	2	1.7
Henan	2	1.7	Jiangsu	1	0.8
Gansu	1	0.8	Neimenggu	1	0.8

Table 2. Descriptive statistics of the study variables, indicators, and sub-indicators.

Variable	Indicator	Sub-indicators	Mean value	Standard deviation
Organizational proximity	Attribute logic dimension	AL1: Organizations have similar material resources	3.50	1.073
		AL2: Organizations have similar financial resources	3.42	1.109
		AL3: Organizations have a similar amount of human resources	3.48	1.111
		AL4: Organizations have similar management spans	3.69	0.864
		AL5: Organizations have a similar amount of channel resources	3.54	0.992
	Cognitive logic dimension	CL1: Organizations have maintained long-term cooperation or have a special relationship history	3.59	1.160
		CL2: The key members of the organizations have a close relationship with the partners	3.85	1.093
		CL4: Organizations always maintain the same goal and prospects for cooperation	4.07	0.838
		CL3: Organizations have a better understanding of each other's behavior and accept their ways of doing things	4.19	0.745
		CL5: Organizations have shared similar values and interests	4.07	0.793
Collaboration propensity	Cognitive trust	CLP1: Organizations approve each other's comprehensive strength in their field	4.23	0.739
	Emotional trust	CLP2: Organizations trust each other dealing with various cooperation matters (i.e., recognize each other's reputation)	4.24	0.764
	Reciprocity	CLP3: Organizations fulfill their responsibilities and help each other solve problems in their cooperation	4.03	0.836
	Inclusiveness	CLP4: Organizations adopt a positive attitude and approach to resolving conflicts between them	4.12	0.858
Cooperative performances	Collaborative satisfaction	COP1: Satisfaction willingness to continue long-term cooperation	4.37	0.672
	Collaborative target achievement	COP2: Achieved the expected goal of cooperation	3.92	0.770
	Collaborative actors' ability improvement	COP3: Improved the ability to learn and innovate	4.07	0.798
	Collaboration cost reduction	COP4: Improved the extension efficiency and saved the related cost expenses	4.17	0.727

Table 3. Descriptive statistics of major variables and their correlation analysis.

Variables	1	2	3	4	5	Mean	SD
1. Geographic proximity	1.000					-	-
2. Attribute logic of organizational proximity	0.007	1.000				3.525	0.791
3. Cognitive logic of organizational proximity	-0.104	0.545**	1.000			3.954	0.694
4. Collaboration propensity	-0.107	0.606**	0.616**	1.000		4.155	0.696
5. Cooperative performances in cooperative agricultural extension	-0.050	0.524**	0.676**	0.674**	1.000	4.134	0.588

**indicates a significant correlation at the 0.01 level; N=121

to 5 representing the degree from low to high, was adopted in all the variables except for geographical proximity, which was measured using a three-level ordinal scale (i.e., value 1 if the CoAE organizations were in the same city, 2 in different cities of the same province, and 3 in different provinces.

The descriptive results for the geographical proximity variable show that among 121 cooperative projects, 29 CoAE projects were in the same province and city, 61 CoAE projects were in the different city of the same province, and 31 CoAE projects were from different provinces. The detailed descriptive statistics of the remaining sub-indicators are given in Table 2, and the variables' correlations analysis is presented in Table 3. In the descriptive statistics (Table 2), a higher mean value indicates a higher level of respective resources, while a lower mean value indicates the case otherwise. For instance, it can be seen that the mean value of collaboration propensity sub-indicators is greater than 4, showing a high level of collaboration among the partner organizations. Similarly, the mean value of the cooperative performance sub-indicators also shows a high level of cooperative performances between collaborative organizations. However, the mean value of sub-indicator COP2is relatively low, which reflects the probability of a certain gap between the actual progress of cooperative extension projects and the expected goals.

Table 4. Scale reliability and validity test.

Variables	Indicators and Sub-Indicators		Factor loading value	C- α value		Variance rate	Fitting index
Organizational proximity	Attribute logic dimension	AL1	0.852	0.823	0.856	The double- factor cumulative variance explained rate 58.539%	CMIN/DF= 2.117、RMSEA= 0.096 CFI=0.916 IFI=0.918
		AL2	0.788				
		AL3	0.702				
		AL4	0.624				
		AL5	0.665				
	Cognitive logic dimension	CL1	0.684	0.790			
		CL2	0.777				
		CL3	0.758				
		CL4	0.735				
		CL5	0.606				
Collaboration propensity	Cognitive trust	CLP1	0.870	0.892		The single factor cumulative variance explained rate 76.065%	-
	Emotional trust	CLP2	0.915				
	Reciprocity	CLP3	0.868				
	Inclusiveness	CLP4	0.833				
Cooperative performances	Collaborative satisfaction	COP1	0.841	0.801		The single factor cumulative variance explained rate 63.692%	-
	Collaborative target achievement	COP2	0.772				
	Collaborative actors' ability improvement	COP3	0.694				
	Collaboration cost reduction	COP4	0.872				

***Reliability and Validity Test*:** In this study, Cronbach's coefficient values are employed as indexes to measure the reliability of the scale. Test statistics (Table 4) show that the internal consistency reliability of the scale has a higher degree because the Cronbach's coefficient values of each scale are greater than the acceptable value of 0.7. In terms of validity, in general, the validity test of the scale mainly includes "construct validity' and "content validity" tests (Schijven and Jakimowicz, 2003).

In the case of this study since most of the variable's measurement scale was made and improved consulting the existing empirical studies. Hence this study employed a construct validity, widely adopted in the similar nature of variables. The paper mainly uses the factor analysis method to test the construct validity of the scale (Thompson, 2004). Firstly, the principal component analysis method is used to perform an exploratory factor analysis (EFA) on the main variables. Table 4 shows that the factor load value of each indicator is greater than 0.5. The load values of all measurement indicators of organizational proximity were distributed on the two main values (attribute logic dimension and cognitive logic dimension). While the load values of the measurement of collaboration propensity and cooperative agricultural extension performance variables were distributed respectively on one main value. Secondly, confirmatory factor analysis was further conducted on the organizational proximity subscales (Table 4). It can be found that the two-factor structure of organizational proximity obtained after the exploratory factor analysis had better fitting indicators for its overall data. In short, it can be concluded that all the subscales employed in this paper all have good construct validity. This indicates that our model will better estimate the relationship between the variables.

Empirical Analysis: In order to estimate the mediation effect of the intermediary variable (collaboration propensity) on cooperative performance in CoAE, this study further adopted the widely recognized mediation effect analysis method proposed by Wen et al. (2005). Firstly, this approach requires a significant correlation between the independent variable and the dependent variable. Secondly, when it satisfies the correlation between the independent variable and the intermediary variable, and the correlation between the intermediary variable and the dependent variable, the mediating effect is significant. In the next stage, if the independent variable is significantly correlated with the dependent variable, it considers a partial mediation, while if not significant, then complete mediation.

Based on the above principles, hierarchical regression analysis with SPSS20.0 was further conducted. Prior to the regression analysis, the multicollinearity test of the variables was performed. The results show that the tolerance value of each variable ranged between 0.512 and 0.989, and the corresponding VIF (variance inflation factor) ranged between 1.952 and 1.012. These values are in line with the test standard of "tolerance greater than 0.1 and the variance inflation factor less than 10". Therefore, it can be concluded that there is no multicollinearity between variables.

In Table 5, model 1 analyzes the effect of the attribute logic dimension and the cognitive logic dimension of organizational proximity on the cooperative performanceinCoAE.Model2 analyzes the influence of collaboration propensity on the cooperative performance in CoAE. Model 3 analyzes the impact of the attribute logic dimension and the cognitive logic dimension of

Table 5. Regression analysis results.

Variable	Cooperative performances	Cooperative performances	Collaboration propensity	Cooperative performances (Mediation)
	Model 1	Model 2	Model 3	Model 4
Control variable				
Geographic proximity	0.005	0.018	-0.068	0.027
Major variable				
OP attribute logic dimension	0.164**		0.344***	0.051
OP cognitive logic dimension	0.472***		0.397***	0.342***
Collaboration propensity		0.571***		0.327***
F value	37.699***	49.167***	37.126***	38.171***
R^2	0.492	0.455	0.488	0.568
Adjusted R^2	0.478	0.445	0.475	0.553

**indicates p<0.01; ***indicates p<0.001

organizational proximity on collaboration propensity. Model 4 analyzes the effect of the attribute logic dimension, the cognitive logic dimension of the organizational proximity, and collaboration propensity on cooperative performance in CoAE.

RESULTS AND DISCUSSION

This empirical study explores the impact of organizational proximity and collaboration propensity on the cooperative performance in CoAE. The cooperative performance was assessed, mainly focusing on the four indicators, i.e., collaborative satisfaction, collaborative extension target achievement, collaborative actors' ability improvement, and collaboration cost reduction. The regression results of Model 1 indicate that the attribute logic and the cognitive logic dimension of organizational proximity has a direct and significant positive effect on cooperative performance (β=0.164, p<0.01 & β=0.472, p<0.001, respectively), which verifyH2a and H2b hypothesis.

These findings indicate that if CoAE maintains the attribute logic dimension, which involves similar material resources, financial resources, human resources, management spans channel, etc., then it will significantly improve the cooperative performance of CoAE. These findings indicate the significance of commonly recognized equal physical resources for the likelihood of their cooperation willingness, achieving collaboration goals, improve stakeholder's skills, and cost reduction. In the case of CoAE, achieving common extension goals in cost-effective manners is basically much pivotal for an organization like agricultural extension, which mainly deals with the outreach of resources (both knowledge and technical). Therefore, improvement in these indicators will lead to effective knowledge and resource dissemination from research stations to the farmers and improve the technology adoption at the farm level, bringing significant positive impacts on the farmers' livelihoods.

Findings further reveal that cooperative performance would be improved if CoAE organizations have similar cognitive resources, i.e., knowledge resources, maintained a special relationship history, close relationship with the partners, better understanding about each other's behavior and working styles, maintained the same goal, values, and interests. This positive correlation indicates the importance of these organizational attributes in cooperative performance. These results are endorsed by the study conducted in Germany, which also implies that both physical and knowledge-based proximities are important for the performance of University-Industry Linkages (U-I) for technology transfer (Villani *et al.*, 2017).

Similarly, the regression results of Model 2 indicate that the inter-organizational collaboration propensity has a direct and significant positive effect on the cooperative performances in CoAE (β=0.571, p<0.001), so the hypothesis of H3 is verified. These findings indicate that the CoAE will perform with better collaboration if there is smooth organizational coordination in the form of accepting each other's comprehensive strength in their field, trusting each other's cooperation matters, fulfilling their responsibilities, and helping each other in resolving problems with a positive attitude. These sub-indicators, which mainly deal with acknowledging other stakeholders and facilitating organizational chain in a certain setting, highlight the importance of organizational coordination in their collaborative performance. Consequently, a well-coordinated and commonly acknowledged agricultural extension networks will perform better in reaching farmer's needs. Similar arguments are raised by the study of Fawcett *et al.* (2019), who stated collaborative capability as a significant determinant of enhanced firm performance and indicated downfall due to conflicting constituents, which results in internal paralysis and an inability to performance and strategic planning.

The regression results of Model 3 show that the attribute logic and the cognitive logic dimension of organizational proximity has a direct and significant positive effect on the inter-organizational collaboration propensity (β=0.344, p<0.001 &

β=0.397, p<0.001 respectively). These results verify the H1a and H1b hypothesis.

The significant positive relationship of the attribute logic indicates that more similar physical resources (Human, financial, and material resources) in CoAE will positively impact the collaboration within the organizations. Likewise, if the CoAE partners share common cognitive values and resources in the form of similar goals, management styles, and knowledge and skills, the more likely the personals and stakeholders will be willing to accept each other's strengths, facilitate the problem-solving attitude, and hence ultimately improve institutions' collaboration tendency. These findings indicate the significance of these features in terms of collaboration of CoAE in China, which are the key actors of farm innovation dissemination, and hence collaboration within the CoAE will facilitate cooperative performance. Literature also highlights the importance of common responsibilities and roles in government inter-organizational collaboration (Gil-Garcia *et al.*, 2019). Moreover, a study on telecommunication organizations in China has also found that common material resources, in terms of organization justice, have an impact on staff behavior towards collaboration leading to effective cooperation and performance (Akram *et al.*, 2019).

As earlier, Model 1 and 3 explained the direct impact of organizational proximity on performance, and institutional collaboration propensity, in term of significant positive correlation. Now model 4 (with the addition of collaboration propensity as a mediating variable in model 1) shows that the collaboration propensity also plays a mediating role between the attribute logic dimension of organizational proximity and cooperative performances. For instance, the regression coefficient between collaboration propensity and cooperative performance is 0.327, which is significant at the p<0.001 level. But the regression coefficient between the attribute logic dimension of organizational proximity and cooperative performance is reduced to 0.051, which shows no statistical significance. Therefore, it can be found that the collaboration propensity variable plays a complete mediating role between the attribute logic dimension of organizational proximity and cooperative performance. The size of the mediating effect is 0.11, and the direct effect size is 0.05. Hence the hypothesis of H4a is verified that the collaboration propensity mediates the relationship between the attribute logic dimension of organizational proximity and cooperative performances.

Similarly, after estimating the direct impact of the cognitive logic dimension of organizational proximity on cooperative performance and the collaboration propensity (models 1 & 3), model 4 estimated the mediating relationship between the cognitive logic dimension and cooperative performance. Results indicate that the regression coefficient between collaboration propensity and cooperative performance is 0.327, which is significant at the level of p<0.001. The regression coefficient between the cognitive logic dimension of organization proximity and cooperative performance is reduced to 0.342, which is significant at the p<0.001 level. Therefore, it can be shown that the collaboration propensity variables play a partial mediation role between the cognitive logic dimension of organizational proximity and cooperative performance. The size of the mediating effect is 0.13, and the direct effect size is 0.34. These results verify the H4b hypothesis that the collaboration propensity mediates the relationship between the cognitive logic dimension of organizational proximity and cooperative performances.

These findings basically indicate the importance of inter-organizational collaboration in cooperative/collaborative performances. In other words, if a certain limitation exists in terms of physical resources of the CoAE, which may hinder the cooperative performance, then an effective role of collaboration can help to overcome these gaps. Collaboration also eliminates the communication gaps within and between the institution, which helps in exchanging organizational cultures, operational styles and improve cognitive dimensions of organizational proximity. This will, in turn, improve organizational justice and hence, stakeholders' efficiency and collaborative performance (Runtu *et al.*, 2019).

Conclusion and Suggestions: This study concludes that in CoAE, organizational proximity has a significant positive effect on their cooperative performance. Meanwhile, the collaboration propensity mediates the relationship between organizational proximity and cooperative performance. Further, the cognitive logic dimension of organizational proximity has a relatively stronger influence on cooperative performance. These findings imply that CoAE should carefully consider the inter-organizational proximity in resources, organizational structure, relationships, cognition, etc. Different extension organizations may enhance inter-organizational proximity by choosing the appropriate cooperative partner actors before they continue to facilitate resource allocation and inter-organizational management and operation. Similarly, they also need to establish a more effective cooperative governance mechanism to respond to the changes in the external environment. Currently, a high asymmetry exists between extension organizations, which directly influences the smooth flow of knowledge and technology between them. Therefore, to enhance their capabilities, extension organizations need to learn identification, extraction, integration, and application of extension technology knowledge. They also need to foster abilities to innovate and develop practical knowledge, increase required inputs to fill the gaps in resource conditions and cognition, intend to seek better partner actors, choose more stable collaboration ways, and ultimately realize the overall promotion of cooperative performance. This will, in turn, strengthen the agricultural technology extension, essential for achieving agricultural productivity targets. Further, the CoAE should put more emphasis on inter-

organizational collaboration quality rather than short-term economic benefits. On the one hand, necessary measures can be taken to enhance organizational proximity to increase mutual collaboration aspiration and willingness. On the other hand, active behaviors such as inclusiveness and reciprocity should be cultivated that are conducive to encourage mutual trust in order to enhance the stability and longevity of the collaboration relationship. Moreover, collaboration propensity among different types of organizations can also be seen as an important indicator for the supervision of the implementation process of CoAE projects to determine the status of project operations.

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REFERENCES

Akram, T., S. Lei, M.J. Haider and S.T. Hussain. 2019. The impact of organizational justice on employee innovative work behavior: Mediating role of knowledge sharing. J. Innov. Knowl. 5:117-129.

Babu, S.C., J. Huang, P. Venkatesh and Y. Zhang. 2015. A comparative analysis of agricultural research and extension reforms in China and India. China Agric. Econ. Rev. 7:541-572.

Beaver, D.D. 2001. Reflections on scientific collaboration (and its study): past, present, and future. Scientometrics 52:365-377.

Birnholtz, J.P. 2007. When do researchers collaborate? Toward a model of collaboration propensity. J. Am. Soc. Inf. Sci. Technol. 58:2226-2239.

Boschma, R. 2005. Proximity and innovation: a critical assessment. Reg. Stud. 39:61-74.

Fahuan, S. 2005. Study on Questions of The Performance Evaluation of Agrcultural Technology Extension In Our Country. Sci. Manage. Res. 3:1-6.

Fawcett, S., A. Fawcett and D. Swanson. 2019. Collaborative capability and organizational performance: Assessing strategic choice and purity. Int. J. Prod. Econ. 214:139-150.

Gao, Q. 2009. Research on innovation of agricultural extension organizations. Social Science Academic Press, Beijing.

Gao, Q. 2010. Development of diversified organizations of agricultural extension in China. Technoeconomics Manage. Res. 5:127-130.

Gao, Q., Y. Yao, and G. Dong. 2015. An analysis of the factors influencing the Choice of Cooperative Agricultural extension Mode: from the perspective of organizational proximity. Issues Agric. Econ. 3:47-53.

Gil-Garcia, J.R., A. Guler, T.A. Pardo and G.B. Burke. 2019. Characterizing the importance of clarity of roles and responsibilities in government inter-organizational collaboration and information sharing initiatives. Gov. Inf. Q.101393.

Hautala, J. 2011. Cognitive proximity in international research groups. J. Knowl. Manag. 15:601-624.

Khan, N.A., Q. Gao and M. Abid. 2020. Public institutions' capacities regarding climate change adaptation and risk management support in agriculture: the case of Punjab Province, Pakistan. Sci. Rep.*pp.*1-10.

Khan, N.A., G. Qijie, S.F. Sertse, M.N. Nabi and P. Khan. 2019. Farmers' use of mobile phone-based farm advisory services in Punjab, Pakistan. Inf. Dev. 36:390-402.

Kirat, T. and Y. Lung. 1999. Innovation and proximity: territories as loci of collective learning processes. Eur. Urban Reg. Stud. 6:27-38.

Knoben, J. and L.A. Oerlemans. 2006. Proximity and interorganizational collaboration: A literature review. Int. J. Manage. Rev. 8:71-89.

Li, L. 2011. Research on the influence of enterprises dependence and openness to cooperation performance in technological innovation network [J]. Nankai Bus. Rev. 4:16-24.

Li, S. and T. Yang. 2007. On the relationship of knowledge sharing and cooperation performance between R & D cooperative enterprises. Sci. Technol. Prog. Policy 24:180-184.

Liao, X., H. Shen,. and S. Zhu . 2012. Operation mechanism of China's agricultural technology extension and its effect on the behavior & performance of local extension personnel. Forum Sci. Technol. China. 8:131-138.

Mao, C., Q. Zhou. and X.Yu. 2016. Influence of cognitive proximity on innovation performance of technological alliance. J. Tech. Econ. 35:12-18.

Qi-Jie, G. and Y. Yun-Hao. 2015. Design and application of the performance evaluation index system of cooperative agricultural extension. J. China Agric. Univ.

Qu, D., and H. Luo. 2011. Study on the performance evaluation index system of modern agricultural extension agencies. Hubei Agric. Sci. 50:1074-1077.

Runtu, T.M., E. Novieastari and H. Handayani. 2019. How does organizational culture influence care coordination in hospitals? A systematic review. Enferm. Clin. 29:785-802.

Schijven, M. and J. Jakimowicz. 2003. Construct validity. Surg. Endosc. 17:803-810.

Shaw, A.T. and J.P. Gilly. 2000. On the analytical dimension of proximity dynamics. Reg. Stud. 34:169-180.

Thompson, B. 2004. Exploratory and confirmatory factor analysis: Understanding concepts and applications. American Psychological Association, Washington, DC, USA.

Villani, E., E. Rasmussen and R. Grimaldi. 2017. How intermediary organizations facilitate university–industry technology transfer: A proximity approach. Technol. Forecast. Soc. Change 114:86-102.

Wang, L. 2011. An empirical study on the training of college students' cooperation intention. J. Higher Educ. 12:93-96.

Wen, Z., K.-T. Hau and L. Chang. 2005. A comparison of moderator and mediator and their applications. Acta Psychol. Sinica. 37:268-274.

Wenan, P. and Z. Hong. 2006. An Empirical Study of the Effects of Trust and Relationship Commitment of Supply Chain Partners on Cooperative Performance. Psychol. Sci. 6.

Zhang, L., C. Chen and J.J. Zhu. 2010. Extension Behaviors and Performance of Rural Agro-technicians: Evidential Perspectives from Farmers' Survey Data. J. Nanjing Agric. Univ. (Soc. Sci. Ed.). 1.

Zhang, S. 2011. The study of diversified agricultural extension organization coordination operation mechanism-based on the investigation of the pear industry technology extension in Hebei province. Ph.D. diss. Agric. Univ. Hebei, Baoding, China.

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