Development and Validation of an Empirical Instrument to Measure Organizational and Institutional Functioning Capacity within International Extension Networks

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Abstract

International extension networks provide vital services to stakeholders using a variety of organizational structures. To continue offering services desired by stakeholders, it is important that both public and private extension networks develop effective organizational functioning capacities. Despite this need, an instrument to empirically examine the perceived capacities of effective international extension network organizational and institutional functioning was unavailable in the literature. The present study developed and validated the International Extension Network Organizational Functioning (IENOF) scale. Scale development included validation of content, response process, internal structure, and consequential utility. Structural analysis indicated the 21-items loaded on four factors, including: network structure and relevance, network management and activities, network strategy and guidance, and network leadership. The results of the study indicate the IENOF may provide an empirical instrument to examine the capacities of international extension network organizational functioning. Furthermore, the analysis provides insights into the nuance and unique characteristics associated with international extension network organizations. Replication studies and further statistical analyses are recommended to examine the nature of the instrument and associated outcome variables of interest. From a practical perspective the IENOF is recommended to be considered as an input to the theory of co-innovation to aid international extension networks in fostering a culture of innovation. Utilizing IENOF insights to inform the theory of co-innovation should better enable extension networks to provide services and programming that meet the needs of network stakeholders.

Keywords: organizational functioning, international extension, co-innovation, scale development, rural advisory services, capacity assessment

Introduction

Extension networks serve a vital role in agricultural communities from facilitating connections among actors in the agricultural value chain to maximizing farmers' competitiveness in global markets (Kassem et al., 2021). However, these services are not without their challenges. Financial constraints, inadequate outreach to farmers, and low agent morale are a few examples of limitations which led to the advent of pluralistic extension services offered by private and non-governmental organizations (Kassem et al., 2021). It is essential therefore that extension services, both public and private, develop effective organizational functioning capacities in order to continue offering services desired by the agricultural community (Lamm et al., 2021a; Maddy et al., 2002).

Previous research has analyzed the capacities critical to effective organizational and institutional functioning of agricultural extension services (Lamm et al., 2021a). The capacities identified were consolidated into five thematic areas: 1) transparency of network policies, procedures, and organizational intent (Schnackenberg & Tomlinson, 2014), 2) knowledge sharing and collaboration (Nahapiet & Goshal, 1998), 3) creation of management policies and guidelines, 4) development and maintenance of intentional, long-term relationships with external stakeholders (Christoplos, 2010), and 5) clear expectations and guidelines for network officers and members (e.g. Marchionni & Ritchie, 2008).

Network Transparency

The first theme identified by Lamm et al. (2021a) concerns transparency of an extension network's policies, procedures, and organizational intent. Transparency refers to the "perceived quality of intentionally shared information from a sender" (Schnackenberg & Tomlinson, 2016, p.1788) and includes disclosure, clarity, and accuracy. Within an organization, transparency is defined as the "organization's reputation for characteristics of organizational integrity, respect for stakeholders, and openness for communication" (Auger, 2014, p.330). The results of Auger's (2014) study demonstrated that organizations who had a reputation for transparency were perceived as more accountable, even if they had not been as transparent through their communication. Therefore, organizational transparency can be considered a function of the organization's reputation for transparency and transparency of the organization's communications (Auger, 2014). Demands for increased organizational transparency related to funding allocations, policies, procedures, and values have risen since the 1990s (Auger, 2014).

Network Knowledge Sharing and Collaboration

Linked to perceptions of organizational transparency are knowledge sharing and collaboration (Schnackenberg & Tomlinson, 2016). As transparency increases, so do awareness, coherence, and comprehensibility of information exchanged between members (Schnackenberg & Tomlinson, 2016). Knowledge management has been defined as the "creation, coordination, transfer, and integration of knowledge so it is accessible and usable by specific stakeholders" (Lamm et al., 2017, p. 94). Effective organizational functioning is primarily influenced by the knowledge of individuals involved (Nahapiet & Goshal, 1998); therefore, it is critical that international extension organizations can effectively manage the knowledge they collect and share it with collaborating stakeholders (Lamm et al., 2021b).

Network Management Policies and Guidelines

Within extension networks, it is important that there are clear organizational policies and procedures, and that there are clear role expectations for agents and members. For example, Rezvanfar et al. (2012) found that there was a significant positive correlation between clarity of job responsibilities and job satisfaction among extension agents. Lamm et al. (2020a) found that emphasizing the role of a network and expectations for members to the public and other stakeholder groups may have contributed to the success of extension service delivery. Sharing this information with potential members, stakeholders, and extension officers can increase perceptions of network integrity and trust in the network (Yee & Yeung, 2010; Auger, 2014).

Network Relationships

With the rise of pluralistic extension services, there are numerous actors involved with international agricultural extension, including clientele, government agencies, non-governmental organizations (NGOs), private agencies, academic researchers, policymakers, and extension network officers (Nettle et al., 2017). A core competency of international extension is the ability to develop and maintain cooperative relationships with other stakeholder groups (Maddy et al., 2002). Trust is essential as it facilitates greater cooperation and positively influences knowledge transfer between entities (Ma & Zhuang, 2013). These relationships across stakeholder groups can lead to greater collaboration (Ma & Zhuang, 2013), increased opportunities for innovation (Fieldsend et al., 2021; Saragih & Tan, 2018; Rijswijk & Brazendale, 2017), and a more participatory model of extension (Camillone et al., 2020; Christopolos, 2010).

Network Organizational Leadership Expectations

Underlying each of the above themes is the importance of organizational leadership, which has been found to be strongly related with organizational performance (Lamm et al., 2019). Effective organizational leaders have numerous responsibilities, including acquiring information necessary for the organization's purpose as well as clarifying and evaluating the information before disseminating it to organizational employees, members, and stakeholders (Lamm et al., 2019; Marchionni & Ritchie, 2008). Additionally, effective leaders must identify appropriate needs and requirements for their organization, plan activities and programming, and take the necessary risks to challenge existing processes and move from planning to action (Lamm et al., 2019). Furthermore, leaders are responsible for inspiring stakeholders, members, and employees through a dynamic vision and supplementing this motivation with transparent communication (Lamm et al., 2019). Effective leaders also gather and maintain resources and establish external monitoring and feedback mechanisms (Lamm et al., 2019). Each of the responsibilities aids a leader in controlling the procedures and outputs of an organization, and when used in conjunction, may contribute to increased organizational functioning and performance (Lamm et al., 2019; Marchionni & Ritchie, 2008).

Conceptual Framework

Within the past 40 years, extension services have shifted from a traditional public sector approach to a broader, pluralistic model that combines public and private advisory services (Norton & Alwang, 2020). While pluralistic extension services have increased flexibility and demand-driven services, the decentralized approach makes coordination complicated and can result in the neglect of smallholder farmers (Norton & Alwang, 2020). To ensure the development and delivery of extension services that benefit all clientele, it is necessary to use an organizational approach which encourages participation (Norton & Alwang, 2020). The integration of innovation into organizational functioning capacities can strengthen the coordination of multi-stakeholder partnerships and transform pluralistic extension services.

Co-Innovation Framework

To increase opportunities for innovation, co-innovation relies on participatory relations with customers and other external stakeholders (Saragih & Tan, 2018). The five co's of co-innovation model was developed by Saragih &

Tan (2018) include: 1) collaboration, 2) coordination, 3) convergence, 4) complementarity, and 5) co-creation.

Collaboration refers to "multi-actors [*sic*] active participatory actions with each distinct characteristics and resources" (Saragih & Tan, 2018, p. 367), and is essential to an organization's survival. To increase insights, creativity, and opportunities, organizations need to acknowledge the experiences of, and partner with, external stakeholders (e.g., suppliers, clientele, government agencies, academic institutions) (Saragih & Tan, 2018). *Coordination* refers to the seamless integration of various actors and resources to accomplish goals shared by the organization and its stakeholders (Saragih & Tan, 2018). It is the responsibility of the main organization, in this case, extension networks, to ensure that every contributing actor has been assigned a role and is using the appropriate resources to reach the desired goal (Saragih & Tan, 2018). To achieve *convergence*, it is necessary that every resource and capability "possessed by various actors in the innovation process – technological, organizational, and institutional – […] be arranged complementarily towards the desired objectives" (Saragih & Tan, 2018, p. 368). Innovation derived from multiple participants must be directed towards a specific purpose (Vesterberg, 2014), and convergence aids in the coordination of resources to the intended goal. *Complementarity* refers to how an organization's technological, institutional, and structural capabilities and resources should be incorporated into the innovation process (Saragih & Tan, 2018). Leveraging these resources collectively leads to a unique value proposition (Saragih & Tan, 2018). One way that organizations can generate unique value proposition within a market is through *co-creation*. This dimension indicates how organizations leverage stakeholders relations to produce innovative, relevant, products and services (Saragih & Tan, 2018).

Co-Innovation and International Extension Networks

Defined as the strengthening of value-adding activities by technological, institutional, and organizational capabilities (Saragih & Tan, 2018), innovation is imperative for the effective functioning of organizations. Within the globalized, interdependent, and competitive market, innovation is necessary for the survival of organizations (Lee et al., 2012). Co-innovation in extension within this paradigm provides a enviornment where "ideas and approaches from various internal and external sources are integrated in a platform to generate new organizational and shared values" (Lee et al., 2012, p. 817).

Within agricultural systems, co-innovation is dependent on the network, structural, and resource elements of an organization (Fielke et al., 2018). Within these multi-stakeholder partnerships, it is vital that actors understand a multitude of differing motives and prioritize innovation efforts accordingly (Fielke et al.,

2018). To increase commitment to the desired outcome, individual actors should be involved in the strategic planning and be aware of the time and energy that will be required from them to reach this objective (Fielke et al., 2018). From an organizational perspective, leaders must ensure there is an appropriate variety of stakeholder groups and encourage open dialogue between stakeholders (Fielke et al., 2018).

International Extension Network Organizational Functioning Scale Development

To encourage innovation, agricultural extension services must ensure their organizational functioning is amenable to co-innovation. Lamm et al. (2021a) recommended the development of a scale to evaluate organizational and institutional functioning capacities of international extension networks, commenting that such a scale would enable extension networks to "establish more holistic and comprehensive insights into [the] organizational strengths and areas requiring further [improvement]" (Lamm et al., 2021a, p. 115). The present study presents a proposed scale as well as validation measures in response to the current gap within the literature.

Purpose and Objective

The purpose of the present study was to develop a novel scale to measure and quantify organizational and institutional functioning capacities of international extension networks, or the International Extension Network Organizational Functioning (IENOF) instrument. The study objective was to establish content validity, response process validity, internal structure validity, and consequential validity for the proposed IENOF instrument.

Methods

Study Context

The present study was conducted as part of a large international research project focused on the identification of international extension network capacity areas. The larger research project included several focus areas, organizational and institutional functioning was one of several areas of interest. Based on the scope of the larger project the results of individual focus areas were examined independently; however, the methods for the present study are identical to those described in previous research. This disclosure is made based on recommendations within the literature to ensure clarity and context for the present

study (Kirkman & Chen, 2011). Furthermore, readers are encouraged to review previous research for a full description of the research methods (see Lamm et al., 2021b) again as recommended within the literature (Zhang et al., 2013).

Study Sample

Individual perceptions of capacities associated with international extension networks were of interest for the study. Specifically, individuals engaged in, or familiar with, international extension networks represented the study population. The study sample was obtained based on identification of international extension networks by the Global Forum for Rural Advisory Services organization. A total of nine networks representing national, regional, and continental extension networks were identified. Networks were located in Africa, the Caribbean, South America, Asia, and the Pacific Islands. A total of 128 individuals were identified for inclusion in the study, a total of 122 responses were obtained for a 95% response rate.

Study Process and Data Collection

The study included both a pilot and a primary study. Data for the pilot study were conducted in person using a paper-based version of the instrument from three extension networks. A total of 43 responses were obtained from the pilot process. Data for the primary study were collected online using the Qualtrics survey platform. A total of 79 responses were obtained from the online primary study. The online questionnaire was distributed according to recommendation by Dillman et al. (2014) and the Tailored Design Method. Specifically, the process included a pre-notice sent to all potential respondents by an organizational context. Next, an invitation and a personalized link to the questionnaire was sent to all respondents. A series of three reminder messages were sent to individuals who had not yet responded every three to five days. Both pilot and primary data study data were included in the analysis.

Scale Development and Content Validity

Development of the IENOF scale items was informed through two primary processes. First, the results of the previous international extension network organizational and institutional functioning Delphi analysis conducted by Lamm et al. (2021a) served as a primary input to the process. Secondly, an extensive review of the literature was conducted resulting in the development of 27 proposed items.

A panel of experts provided a review and feedback regarding the proposed scale and associated items. The panelists had expertise in scale development, international extension, as well as evaluation. The expert panel review, in conjunction with the scale development process, helped to established content validity.

Response Process Validity

Items were rated on a four-point, Likert-type scale with possible responses ranging from *1-little to no capacity,2-some capacity, but very limited, 3-good capacity, but could still be improved, and 4-exceptional capacity, no need for improvement*. An *N/A-not applicable or no knowledge* option was available as well. Response process validity was established during the pilot data collection. Specifically, once pilot participants completed the instrument a focus group and debrief among respondents was conducted. Respondents were asked to provide their input regarding the readability, interpretability, and general feedback of scale directions and items. Overall, limited feedback was provided from respondents. Minor wording adjustments were made; however, no fundamental modifications to the instrument were undertaken from the pilot to primary study phases.

Internal Structure Validity

Based on recommendations in the literature (see Crocker & Algina, 1986; Messick, 1995; Lamm et al., 2020b), several methods were used to establish internal structure validity of the instrument. First, descriptive statistics, including measures of skewness and kurtosis, were computed for each factor and the overall scale to examine normality and distribution of survey responses. Next, internal consistency was analyzed using the Cronbach's alpha coefficient.

Factor structure was analyzed using Exploratory Factor Analysis (EFA). Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) values and Bartlett's test of sphericity were calculated to establish whether factor analysis was justified. Specifically, KMO values greater than or equal to 0.500 and statistically significant Bartlett's test of sphericity results indicated further factor analysis was justified (Lamm et al., 2020b). A significance level of $\alpha = .05$ was set *a priori*. Varimax rotation with Kaiser normalization was conducted for factor identification. Individual factor loadings with absolute values greater than 0.500 and eigenvalues greater than 1.0 were retained (Kaiser, 1960). Data were analyzed using SPSS v26.

The factor structure was hypothesized to align with the themes identified previously (Lamm et al., 2021a). The anticipated factors included: transparency of network policies, procedures and organizational intent, knowledge sharing and

collaboration, creation of management policies and guidelines, development and maintenance of intentional, long-term relationships with external stakeholders, and clear expectations and guidelines for network officers and members.

Consequential Validity

According to Messick (1995), "The consequential basis of test interpretation is the appraisal of value implications of score meaning" (p. 748). Therefore, to establish consequential validity for the scale a follow up survey was conducted with 15 international extension network representatives associated with the larger research project. Respondents were asked to provide their agreement or disagreement to a series of Likert-type items related to the usefulness of the results associated with the scale, and if they planned to use the results to change their networks. A total of 14 responses were obtained for a 93% response rate.

Results

To establish whether an EFA was warranted both the KMO measure of sampling adequacy and Bartlett's Test of Sphericity analyses were completed. A KMO value of 0.768 was observed, furthermore the Bartlett's test yielded significant results (χ^2 = 1130.27, $p < .001$). The results of the preliminary analyses indicated further EFA was justified. A total of seven factors with eigenvalues greater than 1.0 were observed (Kaiser, 1960), accounting for 73.203% of the cumulative variance (Table 1). Among the seven factors there were three factors which included a single variable and were thus removed from subsequent analysis. Furthermore, there were two items which failed to reach the 0.500 factor loading threshold and were also removed. Lastly, there was a single item which cross-loaded across two factors and was removed. The remaining 21 items loaded onto four factors. Based on the nature of the items observed within each factor, names were proposed. The first factor included seven items and was identified as network *structure and relevance.* The second factor included six items and was identified as network *management and activities*. The third factor included six items and was identified as network *strategy and guidance*. The fourth factor included two items and was identified as network *leadership*. A subsequent EFA was conducted on the four identified factors (Table 2).

Table 1
Exploratory Factor Analysis of IENOF Scale

	Factor						
Scale Items	1	2	3	4	5	6	7
A system for continuous improvement is present (ORG20)	0.76						
Processes that define how activities should occur are in place (ORG19)	0.72						
There is a plan for catastrophes (ORG23)	0.71						
The network is compliant with relevant laws, policies, and regulations (ORG21)	0.62						
The network has appropriate legal expertise and support (ORG22)	0.59						
The network is financially viable (ORG27)	0.58						
Network outputs are valued by RAS professionals, stakeholders, clientele or policy/decision makers (ORG25)	0.57						
Network officers are committed to RAS (ORG7)		0.90					
Network officers are committed to the success of the network (ORG8)		0.81					
Network activities are well organized, structured, and reliable (ORG15)		0.62					
Network officers are aware of when and how to reach out to network members (ORG6)		0.60					
A culture of innovation is present (ORG17)		0.60					
The leadership delivers results (ORG11)		0.51					
Network members work towards the network's vision and mission (ORG3)			0.78				
An operational plan is in place to guide network activities (ORG18)			0.62				
The leadership guides the network through change effectively (ORG10)			0.62				
Network officers trust one another (ORG9)			0.53				
Network members are aware of the vision and mission (ORG2)			0.53				
The vision and mission are appropriate (ORG1)			0.51				

Table 1 (continued)
Exploratory Factor Analysis of IENOF Scale

	Factor						
Scale Items	1	2	3	4	5	6	7
There are a sufficient number of network officers in place to handle and maintain a quality network in a timely manner (ORG12)				0.82			
Dynamic leadership is exhibited at all levels (ORG5)				0.82			
*The network's activities are aligned with the vision and mission (ORG4)			0.53			0.51	
**Network members are interested in working together (ORG13)					0.88		
**The network provides value-added services that otherwise would not be available to RAS professionals, stakeholders, clientele, or policy/decision makers (ORG26)						0.72	
**There is sufficient funding to support organizational staff and infrastructure (ORG24)							0.80
***Network members come from multiple disciplines and represent multiple perspectives (ORG14)							
***Stakeholder's needs drive activities (ORG16)							

Note: Principal Component Factors. Blanks represent absolute loading values < 0.500. Item identifiers in parentheses. RAS – Rural Advisory Service. * - Cross loaded item, ** - Item failed to reach minimum threshold for factor loading, *** - Item removed based on single item factor.

Table 2
Exploratory Factor Analysis of Extracted IENOF Scale Factors

Extracted Factor	KMO	Bartlett's test of sphericity	Eigenvalue	Cumulative Variance Explained
Structure and Relevance	0.768	173.046***	3.429	48.980%
Management and Activities	0.781	229.269***	3.199	53.311%
Strategy and Guidance	0.787	164.289***	2.919	48.642%
Leadership	0.500	34.913***	1.517	75.826%

Note: *** - $p < .001$.

Based on the EFA results for the overall IENOF scale and the extracted factors, additional analyses were conducted to further establish internal structure

validity. A summary of descriptive statistics and Cronbach's alpha results are presented in Table 3. The results of the analysis, specifically observed skewness and kurtosis values, indicate acceptable response distributions (see Fabrigar et al., 1999; West et al., 1995). Furthermore, the observed Cronbach's alpha values were deemed acceptable given established thresholds (see Cortina, 1993; Schmitt, 1996; Streiner, 2003, Taber, 2018).

Table 3
IENOF Descriptive Statistics and Reliability

Factor	*N*	*M*	*SD*	Skewness	Kurtosis	Cronbach's α
Structure and Relevance	75	2.373	0.540	0.179	-0.187	0.815
Management and Activities	108	2.881	0.475	-0.417	-0.096	0.812
Strategy and Guidance	109	2.939	0.489	0.076	-0.119	0.784
Leadership	115	2.504	0.661	-0.365	-0.246	0.677
IENOF	71	2.702	0.434	-0.104	0.166	0.911

The nature of the relationships between the overall IENOF index as well as the extracted factor were examined using Pearson correlations. The results of the correlational analysis are presented in Table 4. Overall, statistically significant relationships were observed between all factors, as well as the overall IENOF index. Between factors, the magnitude of observed correlations ranged from low to substantial (Davis, 1971). The observed correlations observed between the factors and the overall IENOF index was substantial to very high (Davis, 1971).

Table 4
Correlation Matrix of IENOF Scale

Scale	1	2	3	4	5
1. Structure and Relevance	-				
2. Management and Activities	.554**	-			
3. Strategy and Guidance	.550**	.660**	-		
4. Leadership	.292*	.505**	.508**	-	
5. IENOF	.836**	.836**	.861**	.573**	-

Note: *$p < .05$, **$p < .01$

To establish consequential validity respondents were asked to provide a response to a series of questions related to the perceived value and impact of the IENOF scale results. Results from the survey indicated that 100% of respondents agreed or strongly agreed the information from the IENOF scale was useful. Furthermore, 92% of respondents indicated they would try to use the IENOF information to modify their networks, 92% of respondents intended to use the

IENOF information to modify their networks, and 83% of respondents expected to use the IENOF information to modify their network.

Conclusions, Implications, and Recommendations

The purpose of this study was to develop and provide preliminary validation for an empirical instrument that quantified perception of organizational and institutional functioning capacity in international extension networks. Instrument validity was established through content validity and response process validity processes, as well as internal structure validity and consequential validity procedures. The initial IENOF scale contained 27 items which were hypothesized to load onto five factors. However, the results of the exploratory factor analysis indicated that only four factors were extracted. The validation processes and procedures resulted in the proposed IENOF scale consisting of 21 items and four factors. The factors included, 1) network structure and relevance, 2) network management and activities, 3) network strategy and guidance, and 4) network leadership.

Network Structure and Relevance

Network *structure and relevance*, was the name associated with the first extracted factor. Specifically, the items observed within the factor related to the procedures used in organizational activities and resources available to the organization. The observed factor was similar to the hypothesized 'network management policies and guidelines' theme from previous research (Lamm et al., 2021a). Specifically, policies and guidelines for individuals and the overall organization have been found to be positively correlated with desired outcomes (Rezvanfar et al., 2012). However, the results of the present study may provide a unique perspective on the nature of capacities specifically relevant to effective international extension network functioning. Specifically, many of the items associated with the factor represent fundamental structural entry conditions to formalization and recognition of the network as an entity. For example, network compliance with laws, appropriate legal expertise, plans for catastrophes, and financial viability all appear to be *structural* in nature, or minimum barriers to entry. In parallel to the structural items the *relevance* of the network was also evident, including outputs valued by stakeholders, processes for activities, and a system for continuous improvement. Accordingly, the need for the network, *relevance*, must coexist with the *structural* elements necessary for the network to exist and function.

Network Management and Activities

Network *management and activities*, was the name associated with the second extracted factors. Within the factor two areas tended to emerge, including the nature of management expectations associated with network officials and the resulting activities associated with the network. Specifically, expectations associated with the *management* of organizational functions carried out by network officers included items such as, officers' commitment to rural advisory services as well as the success of network. Officers are also expected to deliver results and know how to communicate with network members. In tandem, expectations around network *activities* were also identified, including a culture of innovation and the organization of such activities.

From a practical perspective, these results were somewhat unexpected. The nature of the factor appeared to conceptually overlap with several themes previously identified in the literature (Lamm et al., 2021a), such as network knowledge sharing and collaboration (Schnackenberg & Tomlinson, 2016), management policies and guidelines (Auger, 2014), and network organizational leadership expectations (Lamm et al., 2019). The results may therefore indicate the interdependence of actors, actions, and structure within international extension networks. This observation may provide novel insights regarding the unique capacities associated with effective international extension networks. Specifically, the relationships between network officers and the network activities may not be as distinct as other non-international extension network organizations. More succinctly, in many international extension networks, the network officer(s) may be seen as more than just a representative of the network, but perhaps as the embodiment of the network itself. The leader as organizational embodiment is a concept established in the literature (see Eisenberger et al., 2010), therefore an associated recommendation would be to further examine this possibility with international extension networks more specifically.

Network Strategy and Guidance

Network *strategy and guidance*, was again composed of items which were not originally hypothesized to coalesce. Specifically, the items retained within the factor following the EFA tended to include both network strategy and operational components, as well as the role of the network officers as it relates to guiding strategy. From a *strategy* perspective, items included the appropriateness of the network vision and mission, the network's members awareness of, and work towards, the network vision and mission, as well as the existence of an operational plan to guide activities. From a *guidance* perspective, the role of the network officer emerged and included the role of officers in guiding the network

through change as well as trust among network officers. Again, the nature of the items within the factor appeared to overlap between multiple hypothesized themes (Lamm et al., 2021a). For example, network transparency (Schnackenberg & Tomlinson, 2016), network relationships, including trust (Auger, 2014), and network leadership expectations (Lamm et al., 2019) were all somewhat represented within the factor. These results may further support the observation that international extension networks represent a unique context where the network entity may not be viewed as necessarily distinct and independent from the officers engaged in the network.

Network Leadership

Network *leadership* represented the fourth emergent factor within the IENOF. The leadership factor included two items which were inclusive of both the sufficient number of officers within the network as well as dynamic leadership exhibited across all levels of the network. These results were again somewhat unexpected based on the hypothesized themes proposed in the literature previously (Lamm et al., 2021a). Although the observed items appear to align very closely with the network organizational leadership expectations theme, the total number of items within the factor was lower than anticipated. The leadership and officer related items were observed to be distributed across many of the other extracted factors, whereas such items were originally hypothesized to all emerge within the leadership expectations factor. The results of the study may indicate that within international extension networks, the need to consider the network, and the network officers and leaders, as a more unified entity may be warranted.

Limitations

Although the study provides several novel potential contributions to both the literature and practice, there are several limitations which must be addressed. One limitation of this study is the location of data collection. Since data were only collected in international extension networks located in the global South, there is limited generalizability of results to other geographic locations. To improve robustness of the scale and provide insights to organizational functioning of extension networks outside the locations studied, future research should include larger, more diverse samples. A larger, more robust, and more diverse study sample may also provide additional statistical power with which more sophisticated statistical techniques, such as confirmatory factor analysis (CFA), may be conducted. Additional examination of the underlying factor structure is recommended. A second limitation of this study is that the instrument only measures perceptions of organizational functioning capacities. Perceptions rely on

individual opinions and may differ from objective organizational functioning capacity present within an organization. An additional limitation is the nature of the observed structure following the EFA. It was unexpected that six of the 27 proposed items would either load as a single item factor, cross load, or fail to load on any factors. Although CFA may help to further elucidate the factor structure of the proposed 21-item version of the IENOF, a recommendation is to consider further examination of the removed items Specifically, items which loaded on a single-item factor may provide important insights; however, additional related items may need to be created to establish a more robust, multi-item, factor. Furthermore, the *leadership* factor included only two items. Although two-item scales have been established as acceptable in the literature (e.g. Gosling et al., 2003), a recommendation would be to consider the development of additional items to further compliment this factor and potentially provide greater insights.

Discussion and Linkage to Conceptual Framework

Results of the current study indicate international extension networks must align their organizational functioning capacities with the co-innovation process to improve service provision to benefit stakeholders. According to Saragih and Tan (2018) the co-innovation process includes five pillars: 1) collaboration, 2) coordination, 3) convergence, 4) complementarity, and 5) co-creation. The results of the study indicate effective international extension networks should be fundamentally aligned, and responsive to, the needs of stakeholders thus facilitating a virtuous cycle of co-innovation reinforcement between network and stakeholders. The driving purpose behind co-innovation is the idea of co-creation, where organizations work with stakeholders to produce innovative products and services that address stakeholder needs (Saragih & Tan, 2018). Previous research has found the shift from public to private extension has sometimes resulted in stakeholders with limited resources finding their needs are sometimes unmet (Norton & Alwang, 2020). Therefore, co-creation is a vital tool in extension, as it gives as stakeholders, including smallholder farmers, an opportunity to contribute to the network, and associated direction.

At a high level the observations from the current study may be conceptually mapped to the pillars of co-innovation. Specifically, *collaboration*, may be linked to the relevance portion of the *structure and relevance* factor. However, relevance without the structure provided by the network is a unique characteristic of the international extension context, one which is recommended to be considered as a first step in the network establishment process. Next, *coordination*, may be linked to both the *structure and relevance* and *management and activities* factors. Coordination may span two of the observed factors in the IENOF and represent the need for appropriate structures and interfaces, in the

form of activities and officers, within the network. Next, *convergence* may be conceptually linked to span both the *management and activities* and *strategy and guidance* factors. Convergence between the factors provides direction and a specific purpose which is enabled through the network mission and vision and implemented through activities. Regarding, *complementarity*, the effective use and implementation of network resources and plans closely aligns with the *strategy and guidance* factor. Specifically, the guidance component may be more applicable based on the dynamic nature associated with change and trust required to foster an environment conducive to complementarity within the network. Lastly, *co-creation* may be most closely aligned with the *leadership* factor. In the context of the IENOF, leadership was conceptualized to include both network officers and members, thus supporting an environment of co-creation.

The results of this study and the IENOF are intended to provide international agricultural extension network organizational and institutional functioning insights from a research and applied perspective. The ability to quantify perceptions of organizational functioning capacities may provide network leaders valuable insights into the current capabilities of their network. Combined with the theory of co-innovation, this instrument may be helpful to inform extension network organizational structures to more effectively provide services to stakeholders.

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