

Learning organization as a framework for networks' learning and collaboration

Learning
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as a
framework

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Received 12 May 2020
Revised 5 March 2021
Accepted 5 March 2021

Abstract

Purpose – The purpose of this study was to use Watkins and Marsick model of a learning organization (1993, 1996), the dimensions of the learning organization questionnaire as a framework for interdisciplinary network collaboration and knowledge sharing.

Design/methodology/approach – The research team used a mixed-methods approach for data collection. Survey data was collected from 181 networks. In addition, data was collected from two focus groups with six participants each.

Findings – Results, in general, showed that the learning organization culture could be used as a framework for interdisciplinary network collaboration. In particular, results showed that shared vision, imbedded systems and knowledge sharing were key driving forces required for successful collaboration.

Research limitations/implications – Theoretical and practical implications were discussed, and conditions for learning organization culture for networks were established.

Originality/value – People in a network era need more than training; they need ongoing, interdisciplinary, collaborative support to solve complex problems. Organizations can only work effectively if barriers to organizational learning were removed. This originality of this paper lies in applying learning organization framework at the network level.

Keywords Complex problems, Interdisciplinary network collaboration, Learning organization culture

Paper type Research paper

Introduction

Since the early 1990s, there has been a growing interest in the concept of the learning organization and learning organization culture (Marquardt, 2002; Watkins and Dirani, 2013). Research studies showed that organizations with strong learning cultures, where individuals are encouraged to expand their knowledge, skills and opportunities to innovate, tend to outperform their competitors (Goh *et al.*, 2012; Marsick and Watkins, 2003). Thus, adopting a learning culture has become a key vision for most organizations (Watkins and Dirani, 2013). Watkins and Marsick (1993, p. 8) defined a learning organization as

This research study is part of a research project funded by a grant from National Science Foundation (NSF 1841905). The data were collected by the N2N GOM research team at the University of Texas A&M under the directorship of Jack Baldauf, PhD. Title of the main project: An International Network-to-Network Approach to Generating New Scientific Community Collaborations in the Gulf of Mexico and Surrounding Region – A Case Study. Funding supported the researchers work on study design, collecting data using an online survey, conducting focus group interviews, and data translation and transcription.



“[an organization] that learns continuously and transforms itself.” Leaders of learning organizations create a learning culture through investing in learning, creating systems for learning, talking about learning and measuring and monitoring learning (Örtenblad *et al.*, 2013). In addition, those leaders actively support their own learning as well as their employees (Marsick and Watkins, 2003), facilitate interactions among members and create communities of learning (Burke *et al.*, 2006) and promote a learning culture (Watkins and Dirani, 2013). Simply put, leadership practices are important for generating a learning culture within organizations at individual, team and organizational levels.

Based on available learning organization literature, the majority of studies included data collected using the organization as the system for learning. Recently, more scholars have shifted their attention to interorganizational learning cultures (Mariotti, 2012), learning about types of knowledge creation among organizations (Brix, 2017) and exploring networks as contexts for learning (Peronard and Brix, 2019). Peronard and Brix argued that interorganizational learning leads to effective collaborations among diverse organizations and networks with integrated opportunities and outcomes that single organizations cannot achieve on their own. In addition, Peronard and Brix suggested that scholars became more interested in network level collaborative actions, and their connection to organizational learning, owing to the rise of collaborative governance trend to tackle complex problems such as global pandemics and environmental change. Based on this premise, this research explores the connection of the learning organization to the learning culture at the network level. In particular, we explore how the dimensions of the learning organization questionnaire (DLOQ) fit as a framework for measuring the learning culture among networks.

We define a network as a number of entities (e.g. individuals, societies, companies, agencies, institutions, etc.) that are structured and actively working toward a shared vision/mission. The strength of networks is their diverse, mostly international, interdisciplinary and cross-sectoral underpinnings. Compared to organizational structure, the network structure is less hierarchical, more decentralized, and leaders coordinate and control relationships that are both internal and external to the system (Stokols *et al.*, 2008). Researchers interested in network level collaboration have stressed that to address common but complex issues that cannot be solved by single disciplinary organization models but rather require a high interaction, high integration, multilevel, multidisciplinary approach, with a strong shared leadership responsibility, data and decision-making authority (Bennett *et al.*, 2018; Brix, 2017).

We adopted an exploratory mixed-methods approach using a triangulation design (Cresswell *et al.*, 2003) where we collected data using a survey and focus group questions. Items related to learning culture in this study were developed based on Marsick and Watkins' (1999) learning organization definition and model. The Marsick and Watkin's model provided a framework for this study.

It is difficult to describe what a “complete” learning organization looks like (Dirani, 2013). Scholars have provided different definitions and operational frameworks for what they think a learning organization should look like, but also suggested that each company produces its own learning organization and that these specific learning organizations are dynamically and continually changing (Marquardt and Berger, 2003; Marsick and Watkins, 2003).

Watkins and Marsick (1997) developed and published the DLOQ which was designed to measure the presumed seven dimensions or action imperatives of the learning organization, including continuous learning, dialogue and inquiry, team learning, empowerment, systems to capture learning, connecting organization to the environment and leadership support for

learning. The original instrument is a 43-item questionnaire they developed based on years of experience working with organizations interested in increasing their capacity to learn, to adapt and to change (Watkins and Marsick, 1993, 1996, 1997).

Problem statement and purpose of the study

The literature reviewed suggested that the LO is a well-developed concept that is confined to the organizational level. With the complexity of problems facing us, more and more organizations are moving beyond traditional organizational boundaries and creating networks of relationships. These networks are characterized by fluid and porous boundaries and by organizational learning taking place within communities of practice. Therefore, the applicability of a learning organization model at the network level needs to be explored. Network-level analysis may require different learning organization dimensions that nurture unique characteristics.

The purpose of this study was to explore whether the DLOQ model established by Watkins and Marsick (1993, 1996) can fit as a framework for measuring the learning culture at the network level. The following research question guided our study: To what extent does a learning organization culture, as proposed by Marsick and Watkins' DLOQ model serve as a guiding framework to measure learning culture at the network level?

Network theory

Networks have, "a set of actors or nodes along with a set of ties of a specified type that links them" (Borgatti and Halgin, 2011, p. 1169). The ties can be either reciprocated or nonreciprocated (Kilduff and Tsai, 2003).

Mohrman *et al.* (2003) found support in their study for using networks to more successfully implement change when compared to traditional, top down organizational change management practices. Haythornthwaite *et al.* (2006) provided detailed descriptions for network activities which were embedded in a complex web of relationships and collaborations that put pressure on existing disciplinary, institutional and personal practices. Both basic information sharing and knowledge synthesis and exchange were identified as supporting activities made possible through network interactions (Mohrman *et al.*, 2003).

When considering knowledge sharing in organizations, it appears that business operations exist within networks and may not always follow within expected economic norms (Kilduff and Tsai, 2003). In their research, Kilduff and Tsai (2003) identified a pattern where critical knowledge flowed through a particular embedded system. Schreurs *et al.* (2019) examined vocational professionals and their extent of networking to create learning opportunities using five different ties. Those ties included informal learning with current team members, informal learning with current supervisors, informal learning through communities of practice, learning from those outside their team but within the organization and finally ties to people outside their organization (Schreurs *et al.*, 2019). Key underlying social mechanisms that supported learning across those ties included interpersonal trust and proximity. This suggests that establishing and building trust within and among networks supports knowledge sharing.

Twum-Darko and Harker (2017) proposed a general framework that included establishing a knowledge sharing strategy, institutionalizing the plan through policies and procedures and having managers lead change through collaboration and shared leadership instead of power (Twum-Darko and Harker, 2017). These actions directly relate to the "create systems to capture and share learning," and "encourage collaboration and team learning" DLOQ (Marsick and Watkins, 2003; Yang *et al.*, 2004).

Interdisciplinary networks

Over the past 40 years, organizations have strategically started moving away from traditional organizational boundaries and started creating networks of relationships (Dyer and Singh, 1998). Many organizations strategically became more fluid internally and had fewer rigid boundaries with other organizations, where organizational learning took place in what has become known as communities of practice (Wenger, 2000). Peters *et al.* (2010) made the point that organizational strength or weakness is linked to the network of relationships in which the organization is embedded and that an organization's critical resources may span organizational boundaries and may be embedded in interorganizational routines and processes.

The rationale for reliance on networks to tackle complex problems is that network collaboration is important for competitive advantage (Haythornthwaite *et al.*, 2006). In addition, networks can work effectively with other entities if features of learning organization cultures are present. In this study, we argue that networks implementing a learning culture with the seven dimensions of the learning organization enable them to collaborate and find solutions to complex problems. In such a framework, learning is seen as playing a pivotal role in system development within a network (Hakansson and Johanson, 2001). Thus, starting with the DLOQ, this will allow us to examine the embedded environment within networks and perceptions of network leaders on features of successful collaborations with other networks.

Typology

Rosenfield (1992) provided a typology for characterizing three types of multi-, inter- and transdisciplinary collaboration. Rosenfield characterized multidisciplinary collaboration by entities working in parallel or in sequence. Interdisciplinary collaboration was characterized by entities working jointly to address common problems. Transdisciplinary collaboration was characterized by entities working jointly using shared conceptual frameworks, drawing together discipline-specific theories, concepts and approaches to address common problems. For the purpose of this work, we will use the term interdisciplinary collaboration as a common terminology for all three types of collaborations. The networks identified for this study are interdisciplinary in terms of sector (government, for-profit, academic, research), interest (such as tourism, health, environment) and geographical location (local, state, regional or international). Details of the nature of the networks are provided in the Methods section.

Interorganizational learning

Research has demonstrated the relevance of interorganizational, interdisciplinary and network learning (Ferrary and Granovetter, 2017). Scholars compared organizational learning to interorganizational learning and suggested that what differentiates the two is the interorganizational dual focus on learning (Brix, 2017). Dual focus on learning occurs when organizations form strategic collaborations with each other to create knowledge and achieve network outcomes that cannot be achieved by individual organizations (Peronard and Brix, 2019). Jones and MacPherson (2006) stated that dual focus on learning occurs when interorganizational learning can create value for the individual organizations, which in turn translate new knowledge into organizational learning. At the same time, knowledge stemming from organizational learning can lead to interorganizational and network learning (Jones and MacPherson, 2006). Brix (2017) suggested that for dual focus on learning happens when:

- individual organizations have the capacity to receive the collective knowledge and have the organizational culture, structure and process, which enable new knowledge creation, integration and institutionalization; and
- when collaborating organizations open up, trust and share information with each other and use the new information to create shared value (Holmqvist, 2004).

In short, interorganizational learning is connected to new knowledge created by the organizations as a collective and knowledge that is transferred from one organization to another (Jones and MacPherson, 2006; Peronard and Brix, 2019).

Benefits of interdisciplinary collaboration

A growing body of research on advantages of interorganizational collaborations has continued to develop. Such research views successful alliance in which collaboration creates new value (Luan *et al.*, 2016). This new value can come from sharing of resources, gaining market entry and enhancing efficiency and effectiveness. Organizations seek to create a new value by collaborating with others to become part of a knowledge network to learn (Peronard and Brix, 2019).

A principal strength of interdisciplinary collaboration is the ongoing and managed integration of expertise among teams, networks, government agencies and academic institutions (Stokols, 2006). Interdisciplinary collaboration provides a paradigmatic shift in solving complex problems because it requires a paradigmatic shift in how teams of experts work together to understand these problems. Whereas traditional organizational models tend to work in silos and combine results at the end, interdisciplinary collaboration integrates diverse expertise to solve a common complex problem such as climate change or health pandemics (Bernstein, 2015).

In addition, interdisciplinary collaboration transpires across and within disciplinary, institutional and cultural boundaries (Luan *et al.*, 2016). If managed well, collaboration potentially enhances creativity, encourages the co-creation of solutions, facilitates joint decision-making and more effective knowledge flow, develops collaborative capability and network member skills, encourages knowledge sharing and improves network's collective memory (Stokols, 2006).

Interdisciplinary network activities

Network collaborations provide convergence in shared priorities to find scientific, technological, social and policy solutions in a systematic and strategic response to complex problems which can rapidly advance technological innovations, productivity and motivation (Lyal *et al.*, 2013). Stokols *et al.* (2008) provided the following four pillars for network learning and collaboration that approximately represent what Watkins and Dirani (2013) identified as dimensions for a learning culture:

- (1) interpersonal (diversity, social cohesion, adaptation to changing task requirements, effective communication, hospitable conversational space);
- (2) intrapersonal (education and training, attitudes toward collaboration, preparation for the complexities and tensions in interdisciplinary collaboration, empowering and shared leadership);
- (3) organizational/technological/environmental (organizational incentives to support collaboration, organizational structure, breadth of disciplinary perspectives, technological infrastructure readiness and high level information security and access, team members' work spaces); and

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- (4) sociopolitical (cooperative international policies, environmental and health threats/crises that prompt intersectoral and international interdisciplinary collaboration and training, enactment of policies and protocols to support successful interdisciplinary collaboration).

Conceptual framework

A body of organizational development research suggests that companies advancing the learning organization concept, within defined systems, and with appropriate programs and practices tend to outperform their counterparts that have not paid sufficient attention to building a learning organization culture (Goh *et al.*, 2012; Marsick and Watkins, 2003). Nowadays, the complexity of social problems has forced organizations to reach out to entities from different disciplines and seek multiple perspectives to address these complex problems. These organizations are relying on their agility to learn and to share their knowledge with other entities to create innovative solutions.

Watkins and Marsick (1993, 2003) argued that the learning organization concept was not a collection of individuals learning within the organization; rather they considered it as a process occurring at different levels of the organization. They provided a framework of seven dimensions for the learning organization and constructed a 43-item questionnaire to measure these dimensions. The dimensions of the learning organization culture have been accorded attention and have been assessed quantitatively in different contexts.

Dimensions of the learning organization questionnaire

Based on the seven dimensions of the learning organization, Watkins and Marsick (1997) formed the DLOQ that was tested and validated empirically (Dirani, 2009; Song *et al.*, 2013). The DLOQ framework has been supported in different organizational settings for quite some time (Watkins and Dirani, 2013). The following seven characteristics or “action imperatives,” describe organizations moving toward the LO concept:

- (1) creating continuous learning opportunities;
- (2) promoting inquiry and dialogue;
- (3) encouraging collaboration and team learning;
- (4) establishing systems to capture and share learning;
- (5) empowering people toward a collective vision;
- (6) connecting the organization to its environment; and
- (7) using leaders who model and support learning at the individual, team and organizational levels (Marsick and Watkins, 2003, p. 139).

In this work, we explore the possibility of using the Marsick and Watkin’s learning organization culture, at the network level, as a framework to assess the extent of network collaborations and identify additional dimensions, if present, that apply at the network level.

Methods

For this study, the research team used an exploratory mixed-methods approach using a triangulation design for data collection (Creswell *et al.*, 2003). The premise of mixed-method research is that combining quantitative and qualitative research “[...] permits [for] a more complete and synergistic utilization of data than do separate quantitative and qualitative data collection and analysis” (Wisdom and Creswell, 2013, p. 5). The purpose of triangulation design is to obtain different but complementary data on the same topic to best understand the research problem (Creswell *et al.*, 2003).

Context and rationale

Our research team identified 181 entities that fit under our definition of a network. Each of the 181 networks consisted of a group of individuals with a common purpose (environmental change). Typical network characteristics include: common objective(s), recognized value in the collaboration, a common knowledge base, a sense of belonging, realization of benefits from the collaboration, agreed methodology and a common vocabulary, among others. These networks had a common interest in the climate change in the Gulf of Mexico (GoM) region from both the USA and Mexico. These networks exist across market sectors, academia and government.

This was an appropriate group of networks to study as they are interdisciplinary in nature, provides diverse information on network partnerships and had a shared understanding of how to collaborate to become part of a knowledge network.

Population and sample

The research team collected quantitative and/or qualitative data from representatives of the 181 networks. The identified representatives were individuals with leadership positions and very knowledgeable about their network activities. We surveyed all networks, and we invited 40 representatives from different sectors (see demographics below) to attend a three-day workshop in Merida, Mexico to identify common complex priorities and to propose new collaborative approaches to solve these problems. At the workshop, we conducted two focus-group interviews with individual leaders from networks that completed the surveys.

Survey data. We developed a survey with 38 total questions. The survey was a result of a collective effort among the research team to come up with a valid and reliable instrument to capture the perceptions of the 181 networks interested in the environmental changes in the GoM. The components of the survey of interest to this research study included questions about the learning organization culture (DLOQ). The team used the seven-item DLOQ questionnaire to measure the learning culture (Chai and Dirani, 2018). All seven DLOQ items were Likert-type questions. The survey also included eight demographic questions. The items were critiqued by experts in the field and were pilot tested by 18 network representatives for clarity. Team members with Spanish as their native language translated the questionnaire to Spanish. We used back-and-forth translation for questionnaire content validity. We used Qualtrics as a tool to distribute the survey and sent an e-mail invitation to all 181 networks along with the survey link in April 2019 and then followed up with two e-mail reminders. A total of 48 usable responses were collected (response rate = 26.5%). Having only 48 responses posed some statistical challenges where we were limited with the statistical analysis, but as our work is exploratory in nature, the survey data was complemented with the focus group data.

Focus groups. The purpose of the focus groups was to identify learning culture features at the network level using the DLOQ dimensions as a guiding framework. The research team moderated two focus group sessions during the first week of October 2019. The focus groups provided authenticity to the research and supported the collaborative nature of the networks.

A purposive sampling technique was used for the selection of the focus groups' interviewees. Purposive sampling was used to ensure the diversity of the participant pool and provide representation from an array of disciplinary backgrounds. The first focus group included two females and four males. The second focus group participants included three females and three males. Both focus groups included network representatives from different sectors from the USA and Mexico. Each focus group was engaged in a 90-min dialogue and provided perspectives relevant to network learning and knowledge sharing.

Data analysis

A convergent design was implemented in the data analysis process of this mixed-method study. A convergent design allowed for the analysis of the data types to be conducted separately and then compared and interpreted the findings from the qualitative and quantitative data analyses.

The descriptive statistics provided accurate depiction of the survey instrument participants. In addition, we ran Pearson correlation to determine the relationship among the seven dimensions of DLOQ (Yang *et al.*, 2004).

The focus groups narrative data conducted were transcribed, translated to English and reviewed by the participants for checking. Focus group transcripts were analyzed using the DLOQ seven dimensions as a guiding framework for thematic content analysis (Braun and Clarke, 2006).

Survey results

Survey data provided information from 48 respondents representing networks from academia, government and the industry, regarding demographics and perceptions on the DLOQ seven dimensions of learning.

Demographics

Demographic data included information such as nationality, geographic scope, network framework and size of network. In total, 61% of networks were from the USA and 35% from Mexico; 50% of the networks had a regional scope; 60% of the networks were connected to academic institutions and/or conducted research; 38% of networks had between 100- and 250-member individuals; and 46% of networks had more than 30-member institutions; 35% of the networks primarily focused on the environment; and most importantly, 84% of the networks collaborate with other networks.

Dimensions of the learning organization questionnaire

Results related to the learning organization culture showed that networks' respondents agreed or strongly agreed with the items measuring learning culture in their networks and supported the seven DLOQ dimensions. In particular, the mean average for building relationships ranked first ($M = 4.35$, $SD = 0.81$), followed by team work ($M = 4.23$, $SD = 0.86$), individual learning ($M = 4.15$, $SD = 0.88$), lessons learned ($M = 4.15$, $SD = 0.97$), taking initiative ($M = 4.15$, $SD = 0.97$), collaboration with other networks ($M = 4.13$, $SD = 0.98$) and leadership engagement ($M = 4.04$, $SD = 1.01$).

In addition to descriptive statistics, we ran a Pearson correlation test for the seven dimensions. While all of the correlations among the dimensions were positive and statistically significant ($p < 0.01$), they reasonably ranged from 0.40 to 0.79, which indicate no sign of restricting either factor discrimination or factor convergence to one construct: learning organization construct. In addition, Cronbach's coefficient alpha reliability for the seven items and one learning organization construct was 0.77 which is similar to results obtained in other studies (e.g. Chai and Dirani, 2018). Table 1 provides a summary of the DLOQ descriptive and correlation data.

Focus groups

We conducted two focus group sessions with open-ended questions focused on the learning culture within networks and how that culture fits within the seven dimensions of the learning organization. Findings from the focus groups provided the research team with insights on networks' learning culture. We organized the following themes based on seven DLOQ dimensions.

Continuous learning

Respondents discussed continuous learning in terms of their experiences working and learning in diverse teams to address complex problems. One respondent suggested that “To learn continuously, we need to learn how to collaborate and learn how to think outside the box.” In addition, the conversation included continuous learning for a particular reason including “generating new knowledge,” “contributing to decision-making” and “generating innovative ideas.”

Inquiry and dialogue

Focus group participants discussed what it meant for their networks to create a culture of questioning, feedback and experimentation. The respondents agreed that their networks were good at “convening, bringing together different/diverse individuals or groups” to work together on “solving complex problems,” “identifying common priorities” and “identifying shared opportunities.” In addition, respondents agreed that networks’ continuous learning should be based on “amplifying/capitalizing on existing knowledge”, “learning from what is”, “facilitate questioning what we know” to “helping to work more efficiently and effectively toward integrated collaborations”.

Team learning

Participants were fully engaged when they discussed team learning and considered it “essential and strategic for successful network learning and collaboration.” Participants discussed team learning within the context of “interdisciplinary teams” and added the term “collaboration” to team learning. The discussion moved organically from reflecting on team learning to discussing “interdisciplinary team learning and collaboration.” One participant explained that team learning meant to her “strategic collaboration and knowledge sharing among teams from different networks” and that “all interdisciplinary team collaborations [she was involved in] led to new learning.” In addition, participants agreed that “trust” was a critical feature in team collaboration. One participant summarized team learning as: “raising the strategic relevance of a network in a specific sector is mainly accomplished through building trust, rapport, and a team with a sense of community.”

Embedded systems

For embedded systems and what it meant for network learning, participants agreed that for learning and collaboration to happen, among networks in general, and within interdisciplinary teams in particular, networks need to have a system for “filtering,

Dimensions	M*	SD	1	2	3	4	5	6
1. Continuous learning	4.35	0.81						
2. Inquiry and dialogue	4.23	0.86	0.52					
3. Team learning	4.15	0.88	0.51	0.73				
4. Embedded system	4.15	0.97	0.59	0.61	0.70			
5. Empowerment	4.15	0.97	0.43	0.50	0.69	0.45		
6. System connection	4.13	0.98	0.47	0.45	0.52	0.43	0.70	
7. Provide leadership	4.04	1.01	0.63	0.42	0.55	0.40	0.69	0.79

Notes: n = 48; **p < 0.01 level (two-tailed), reliability for the seven items and one learning organization construct was 0.77. *Likert-type scale: 1 – strongly disagree, 5 – strongly agree

Table 1.
DLOQ means, standard deviations and correlations

organizing and managing important information.” In addition, participants agreed that networks need to have “infrastructures that support collaboration and community-building,” “need to promote and sustain values and standards,” and should “have organizational policies that promote collaboration,” “use new technology” and “have physical structures such as available spaces that support an open learning culture.” One participant suggested that “successful networks are the ones with complex effective systems that can overcome interdisciplinary barriers” and he gave an example where embedded systems help with “understanding and communicating risk and uncertainties, and provide infrastructures for collaboration.”

In addition, participants agreed that at the network level, embedded systems are needed to share data within, and among, networks to fill information gaps. One participant noted that “currently there is no universal mechanism to treat/process the data in a uniform, standardized method for comparison.” Another participant commented that “data accessibility and knowledge as to data acquisition would reduce redundancy and result in a cost avoidance for acquisition of future data, where the data already exists.” A third respondent suggested that “we need to understand networks priorities, and current and future investments in data sharing, along with a willingness for collaborations, will accelerate discovery towards reducing shared vulnerabilities.”

Empowerment

We then asked respondents about empowerment as a dimension for learning and collaboration. By choice, participants did not spend adequate time discussing empowerment. Still, they agreed that networks need to be “investing and providing/offering the means and resources their members need.” In addition, participants referred back to the idea of “building trust, rapport and having a sense of community within the interdisciplinary teams.” In addition, participants suggested “involving experts in their sectors” as a feature of empowerment and “having a shared leadership as a strong indicator of empowerment within teams”.

System connection

Participants agreed that system connection was a main feature for interdisciplinary network collaboration and learning. They interpreted system connection through “addressing important societal problems” and “engaging the outside community.” One participant commented that “it is critical to bring in the local communities to the decision-making table.” Another participant echoed the same perception: “We need input from local communities and engage them with understanding the threats and vulnerabilities of the problems because local communities can provide other variables.” Another participant suggested that “engaging politicians and decision-makers at a certain point, would help focus on shared priorities and with solving complex problems”.

Strategic leadership

Participants strongly agreed that strategic leadership was critical for network learning and collaboration. In particular, participants discussed shared leadership within interdisciplinary teams and agreed that it allows for “teams to address common goals” and the “ability to bring together individuals from different disciplines with different points of view.” One participant commented that “a lot of networks are trying to collaborate, but those who succeed are the ones that have strong leadership and are able to bring their ideas together.” Another participant suggested that:

[. . .] a lot of networks are dysfunctional and I see some hope when networks discuss common issues, because network for the sake of network is not enough, networks crystalize around a cause and leadership is critical for that to happen.

Another respondent provided the following comment:

[. . .] we need interdisciplinary teams with supportive leaders and a clear vision because we might lose focus if we do not have leaders to provide a clear view for what the ultimate goal is.

Addressing large-scale complex problems

Another major theme that emerged from the focus group discussions was dealing with complex problems. Each discipline has its own definitions, approaches and worldview about how to tackle complex problems. Participants agreed that current problems that face us are complex, and complex problems need interdisciplinary collaboration to be solved. One participant commented that “when the topic is big the process is very complex.” Another participant suggested that “it is impossible to solve complex problems in a linear way, we need to take into consideration multiple factors whether they are social, economic, environmental, health related or otherwise.” A third participant noted that:

[. . .] maybe networks do not agree about the threats/mutual interests that we need to tackle, but the process [interdisciplinary collaboration] should not stop because it allows us to be productive and engaged at a high level.

Overall results indicated that the DLOQ provides a basis for network learning and collaboration. Survey data showed that team learning dimension was significantly correlated with the other six dimensions. This was corroborated by the focus group results. On the other hand, the empowerment dimension was relatively less significant based on the correlation results, and focus group participants interpreted it through leadership, vision and embedded systems. Participants also identified the following as a main feature for successful network collaboration and learning: commitment to addressing complex problems through interdisciplinary team learning and collaboration.

Discussion

Results of this study showed that the learning organization culture model as defined by [Marsick and Watkins \(1999\)](#) with the seven action imperatives provides a framework applicable at the organizational level as well as at the interorganizational level through network collaborations. Results provided some guidelines for a learning organization to succeed at the network level. First, team learning is paramount for interdisciplinary collaboration. Second, leaders need to shift more to a collective approach to solving complex interorganizational problems. Thus, shared leadership could be the answer to interorganizational learning and to networks' collaborative success. Third, results showed that large-scale problems require diverse broad cross-sector coordination, learning, knowledge sharing and collaboration. The idea is to build a new learning community from the diverse communities based on shared priorities, to address actionable solutions to complex problems.

Practical implications

Network learning and collaboration is not new, but results from this study showed that a learning culture can thrive at the network level and can have a collective impact, especially when interdisciplinary networks and interdisciplinary teams have a shared goal or vision. In this regard, results supported the notion of interorganizational dual

focus on learning (Brix, 2017) where individual networks receive, generate and institutionalize knowledge through a learning culture and then open up, trust and share information with other networks to create shared values (Holmqvist, 2004; Peronard and Brix, 2019).

Our findings also supported the literature that strong leadership with a shared vision was a significant dimension for network learning, and without a learning culture, it would be hard for networks to collaborate or produce meaningful solutions (Bridle *et al.*, 2013). In addition, results showed that team learning was significantly important as a network learning dimension. In particular, results showed that building trust and transparency were critical for team learning and for network collaboration. This result supports previous research findings, such as Stokols *et al.* (2008) who argued that trust, among other features was important for learning to occur at the team level.

Similar to a learning culture in organizations, embedded systems and systems' support were part of our findings as features of network learning. Our findings suggested that organizational structures, organization incentives for collaboration, technological infrastructure and readiness, governing policies within and among networks, even available physical spaces were critical for learning culture at the network level.

Based on the results of this study, the difference between a learning organization and a learning network is the scope and complexity of the problem or problems at hand. At the network level, both scope and complexity of problems are more sophisticated. Thus, a learning network requires convergence in shared priorities to tackle problems that have an impact on technological, social and policy solutions in a systematic and strategic response to complex problems (National Research Council, 2015).

In short, results of this study provided more evidence that a learning organization framework as defined by Marsick and Watkins (1999) is applicable at the network level. In addition, greater progress could be made in tackling many complex problems if businesses, government, academic networks, along with the local communities, were brought together around a learning culture with a shared vision to create positive change. Still, many entities continue focusing on independent action to solve their problems which usually results in isolated impact.

Theoretical implications

From a theoretical perspective, addressing network level collaborations with the complexity of problems, complexity of network structures and complexity of the process for learning, knowledge sharing and management, all would require a comprehensive approach. We recommend closely looking at network theory as a framework for learning networks. This recommendation stems from the fact that network theory addresses complex systems and how structure can arise from them. Within networks, the theory would address how shared leadership, network structures, processes and practices shape social relations and create systems that ultimately influence different systems. As a process, the theory explains how large numbers of independent agents can spontaneously order themselves into a collaborative system.

In addition, we recommend further research to explore how particular network learning dimensions, such as shared leadership and integrated teams, can facilitate learning at interorganizational and network levels.

Limitations and conclusion

One limitation within this study is the use of self-reported data in the survey instrument. Self-reported data can be difficult to verify. Participants may self-report inaccurately owing

to selective memory or could provide inaccurate responses owing to fatigue from survey and focus group interviews. Another limitation is the number of respondents. The quantitative results obtained from this study could not be generalizable because the sample size is small, and it is not enough to represent the population accurately. In addition, survey respondents were leaders of networks with broad understanding of their networks but only provided their own perspectives to the questions. Another limitation is related to the characteristics of the 181 networks and the fact that 60% of these networks were connected to academic institutions. This could have influenced what the respondents valued in terms of shared knowledge or shared leadership within, or across, networks.

In this study, our goal was to explore the learning organization culture at the network level starting with the DLOQ as a conceptual framework for network collaboration. The study produced new insights on interdisciplinary collaboration and conditions that affect network engagement in learning and collaboration, as well as the theoretical underpinnings that lead networks to become learning networks.

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