Interorganizational Networks as Emerging Learning Organizations

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Abstract

As the topic of sustainability is gaining a lot of importance, organizations in the aviation industry are coming together to form networks. The purpose of the study is to understand the concept of inter-organizational networks as potential learning organizations and find out how facilitating processes that enable these inter-organizational networks like collaboration, communication and knowledge management operate within networks. organization. Further research will explore processes of learning in networks to investigate alignment and resemblance with the concept of sustainable learning organization. The basic design of the study consists of semi-structured interviews of two networks in the aviation industry as primary data in order to support research questions with empirical analysis. In addition, systematic review of academic literature and official websites of various network stakeholders was used as a secondary data collection source to discover track record of current research study in this field and identify knowledge gaps and areas for further study. Major findings include impact of formal and informal structure of networks on learning processes and objective setting for the network. It also depicts a need for a holistic and systematic approach at interorganizational level in order to form a learning organization.

Key words

Learning, Inter-organizational Networks, Aviation, Learning Organization.

Table of Contents

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1 Introduction, Aim and Problem

1.1 Background

The environmental impact that aviation is generating is the one of the biggest issues that sustainability studies report. A range of scientific publications like Special Report on Aviation and the Global Atmosphere or Environmental Reports in 2016 and 2019 by ICAO concluded key areas affected by aviation's operations. Gas emission that aircraft produces is said to be a major determinant in climate change and worsening air pollution. According to ICAO's reporting "aircraft emit gases and particles which alter the atmospheric concentration of greenhouse gases" and as per recent studies aviation emissions of CO_2 is 'approximately 2% of the Global Greenhouse Emissions". Gradual changes in order to reduce consequences of CO_2 emissions that are expected to grow 3-4% per year (ICAO, 2020) have been drafted in multiple state action plans by many country members of IATA and ICAO. (IATA, 2017; ICAO, 2020).

The term sustainable aviation then has been coined in order to stop unnecessary changes and exemplary activities can be found in Nordics where many initiatives and complex monitoring had been implemented. The main focus that was put in sustainable aviation was a complex area of sustainable alternative fuel (SAF). The development of fossil-free source of energy was reported in Nordic Energy Research study on perspectives of use of alternative fuels in this region for aviation. It was evident that aviation needed a joint plan and multi stakeholder approach in order to undergo transition from conventional jet fuels to zero-emission fuels. There had been a progress in research study about feasibility and commercial viability. Although a demand for sustainable alternative fuels are still minimal due to high production costs, the high potential and perspective of achieving 50% CO_2 reduction in 2050 are positively motivating various organizations across the industry to introduce global standard sustainability requirements for SAF that are still missing. Initiatives are emerging including ICAO (International Civil Aviation Organization) that launched the carbon-neutral growth scheme. It comprises a wide range of scientific reporting and knowledge sharing databases and a variety of seminars where different actors can access platforms to achieve their goals.

Due to such a decentralization of global policy on alternative fuels, small collection of initiatives can be observed. In Nordics, various organizations from corresponding fields came together to address the carbon neutrality issue. Their main goal was to develop tech, build an integrated and compatible infrastructure and pass knowledge onto other organizations to address a lack of global sustainability standards for sustainable aviation.

1.2 Research Problem

Increasingly, there is a growing pressure on organizations to tackle the environmental impact of their operations. It facilitates the need for more collaborative work between various stakeholders to undertake a dialogue for finding common sustainable outcomes. Lacking aspects of research studies can be seen in perceiving these interorganizational networks as emerging learning organizations. This exploratory research focuses on thorough analysis of interorganizational collaboration of those networks and investigates aspects of learning facilitation and knowledge management. For the purpose of this study Nordic networks for sustainable fossil-free aviation and Central European networks for sustainable aviation were utilized as a subject of the research to help understand mechanisms driving organizational learning in those types of newly emerging networks. Such a necessity to concentrate and integrate various functions and cross-operational aspects in this industry makes it a perfect study case as interorganizational networking in order to solve complex and multidimensional sustainability issues like

carbon environmental impact is evident in aviation where global standardization and integrative operationalization of airport infrastructure, aircraft production, supply chain and business models are essential to achieve systematic change.

1.3 Aim

Our aim for this paper is to analyze interorganizational networks with the focus possibility to consider them as emerging learning organizations. To do this, researchers explore how the learning processes are facilitated in such networks in the aviation industry to support it into becoming a learning organization. As research shows that organizational learning is a first step for any organization to become learning organizations, study first investigate 3 facilitating processes that are evident in networks and then define learning enablers that are resulted from above mentioned processes. This paper focuses however on applying learning organization concept to interorganizational network in order to solve sustainable problems. Therefore, learning organization concept will be utilized to test if their attributes and disciplines can be applied to network organizations that were created with the specific purpose of solving sustainability issue of carbon use in aviation industry. In conclusion, the question that this research wants to answer is to explore the potential of these aviation interorganizational networks to become a learning organization of the future with focus on finding sustainable outcomes for aviation**.**

1.4 Research Questions

RQ 1

How do facilitating processes of collaboration, communication and knowledge management enable learning in aviation's interorganizational networks?

RQ 2

How can interorganizational networks for sustainability become emerging learning organizations?

1.5 Previous Research

1.5.1 Interorganizational Networks and Learning

Thorelli (1989) focuses his work on interorganizational networks as a solutions for complex business issues between open market and internalization (taking over organization's task or absorbing it entirely) in international operations or international marketing, technology transfer or information exchange. Networks call for holistic approach. Thorelli (1987) talks about strategic planning for effective network management. At the beginning interorganizational networks were studied around non-profit agencies. Steadily it was proliferating into strategic management issue for businesses especially with complex operation and international outreach. Strategic renewal is the main reason networks exist and typically concentrated on product and firm positioning ,marketing channels and franchising, patent and trademark licensing, turnkey contracts or 'systems selling' reciprocal trading, transactions between divisions of the company, joint ventures, mergers and acquisitions vertical integration or internalization. Entire economy

can be perceived as one big network of organizations with competing crisscrossing networks interrelated and intertwining with one another. Nodes (positions/participants) or links/relationships (edges) Thorelli (1989) believes that network ideas is highly applicably in industrial international marketing or strategic planning. Study brings important aspect of networks and systems and why those networks simply cannot be called systems? As network consists of more than one participant that invitation long-term relationship, it still retains its autonomous entities that decides and operate on its own. It makes a network a special type of system where internal interdependencies are changing rapidly over the long period of time and it adjust the 'system' to new complex dynamics of the socio-economic activity. Idea of networks had been applied and developed in public administration where such dynamics are very often taking place. As an example, research study by Manring (2003,2007) outlines research on public management of ecosystems that are based on network organizations. Manring's continuous studies helped to elaborate first understanding of role of networks in sustainability and its application to organizing and managing networks as learning entities.

According to previous studies networking enhances learning (Gibbs & Coleman, 1990; Håkansson et al., 1999). Organizations learn either through their own experience or through experience of others. Own experience is through effective communication and internal collaboration but also through creating knowledge as a result of individual and team learning. When organizational structure is expanded to two or more organizations like it happens in networks, learning happens through network's own experience and also through experience of others where knowledge transfer is the key process for learning. As network can be perceived as organization on its own the same processes occur as in its single entities that demonstrated international and holistic perspective of process. This study focused on selected processes that facilitates network's learning. Learning is a crucial process in networks that study uses to offer solution to sustainable development in aviation. Each facilitating process is outlined and explained in sections below.

1.5.2 Learning organization concepts

Learning organization has emerged as a concept to tackle complex issues in multiparty organizations a quite long one. Early work of Senge's (1991) and Pedler's (1989) paved the way for other studies on 'learning companies. By definition learning organization" facilitates the learning of all its members and consciously transforms itself and its context" (Pedler et al., 1989). Broader definition is proposed by Senge (1991) that aggregated more organizational and leadership sense. It is defined as 'organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free and where people are continually learning how to learn together" (Senge, 1991).

There is also a distinction between organization learning and learning organization. Wilson & Beard (2014) claimed that the first one was the element in the processes that happen in learning organization and latter is a whole system that defines organization as 'learning company' Concept was applied mainly to construction industry and public administration where multi- level stakeholder engagement and various actors come at play mostly at international level. Trade organizations, big cross border projects, infrastructure building or international governance are the one of them whose learning organization concept is evident.

1.6 Layout

In the first part of the paper, we bring the description of organizations in the form of an interorganizational network that operates for achieving sustainable outcomes in aviation. Organization seems relevant to the research as it represents a collaborative arrangement of aviation networks in the aim for achieving sustainable goals. Participants are a collection of airlines, airport infrastructure firms, technology companies, research agencies and aircraft-building developers that establish these networks.

Next, we present the previous studies on the above concepts and then bring theoretical framework around organizational learning, organizational culture, collaboration, communication and knowledge management in the context of interorganizational networks. Academic documents analysis explores different aspects, concepts and observations around relationships and learning processes that are taking place at both organizational and interorganizational levels.

Finally, we will analyze data received from semi-structured interviews, and websites including downloaded documents for those websites to conclude our findings related to both formal and informal interorganizational networks for sustainable aviation.

2 Theoretical background

In this chapter the researchers introduce the theoretical foundations for this paper and what aspects of the theories the analysis will be based on to answer the research questions.

2.1 Inter-organizational Networks and their facilitation

2.1.1 Facilitation through collaboration

Collaboration with multiple stakeholders are being enabled often by networks. In order to form a network, participants are required that are called nodes and connections between them that are called edges (Zema & Sulich, 2019). Social theory stresses out the importance of network structure and implies how organizations interact and how frequently in with the aim to exchange resources (Grootaert et al., 2004). Scholars emphasize the role of networks that are centrally oriented in social capital (Borgatti et al., 1998). Coleman (1990) concludes in his research that effective networks provide a great value to social capital by diversifying and exploring different connections, providing group members with more empowerment and by accessing previously inaccessible resources that enhances their scope of activities and initiates collaborative actions. In networks different stakeholders must interact with different parties in order to develop joint goals, interests, solutions however interaction within a single stakeholder party also occurs bringing essential learning processes and knowledge creation (Beeby, 2000; Curseu & Schruijer, 2018). Collaboration then is a major factor in networks as it uses collective forces to generate knowledge that eventually resolve issues, develop ideas, or simply achieve some goals that were not possible to gain by a single stakeholder. By definition, stakeholders are developing joint goals within collaborative arrangement, but it is to be indicated as mutually beneficial for the network they operate in and also for the stakeholder itself. Study of Gray (1989) provides a good starting point to understand collaboration as a need for different people to come together and to share activities that will bring their interdependencies and find added value in their work. In a result a common problem is potentially

formulated, and a goal established. Thinking about stakeholders as separate organizations or actors representing them also involved in a relational process can resemble situations to collaborative business arrangements structure as they are formed voluntarily from a need to address an issue, a concern or opportunity resulting in joint problem/mission statement formulation together with a set of objectives and goals. (Gray, 1989; Larsson & Larsson, 2020).

It is also worth mentioning a collaboration from the perspective of conflict and power. Gray (1989) believes that the main source of need for collaboration is deeply rooted in the concept of self-interest also analyzed by social theorists like Marx and Freud. Constant need to take care of self-needs generate a 'conflict' that needs to be resolved.

That conflict is defined here as a neutral expression of differences that need to be managed hence collaboration is often referred to as 'constructive management of differences' (Gray, 1989). That very social theoretical concept can be translated somehow into business perspective that is perceived lately in reasoning for establishing collaboration. Different organizations seek to collaborate in order to gain a benefit for themselves : support in strategy renewal (Jones & Macpherson, 2006; Peronard & Brix, 2019; Zema & Sulich, 2019) enhancing customer experience and needs (Peronard & Brix, 2019), supply chain integration (Larsson & Larsson, 2020) and overall economic or technological change (Beeby, 2000). Although joint strategy is implemented in order to achieve these goals that are beneficial for each and every member of collaboration thus power is being shared consciously (Gray, 1989). It can be said that historical approach is shifting from creating a platform for dispute resolution (Gray, 1989) to a space for developing and realizing joint goals (Curşeu & Schruijer, 2020).

Trust is also mentioned as a key driver for collaboration success and main integrator. Also, along with solidarity is described as a driver for social groups to undertake cooperative actions (Gibbs & Coleman, 1990).

Another great aspect of collaboration is a process of collaboration itself. Many researchers mentioned stages and phases that often complement each other. Study of Gray (1989) explains a different stages of collaborative process : (a) problem setting: defining the problem, identifying legitimate stakeholders, and getting the parties to the table; (b) direction setting: establishing ground rules, creating the negotiating agenda, searching for options, and reaching agreement; and (c) implementation: dealing with constituencies, building support for the agreement, and ensuring compliance.

2.1.2 Facilitation through communication

Communication was chosen as a facilitating process to be researched in this study as it plays an important role in bringing learning capabilities in organizations. Study of Wilson and Beard (2014) demonstrated an important of communication in projects and its significance to dialog between major stakeholders. Lack of communication or social interaction was a result of lack of understanding between various stakeholders like architects, designers and producers (Wilson & Beard, 2014).
Communication has been branded by first theorists as essential in networks as a major conveyor of information exchange and tool to access resources (Coleman, 2009). Such a type of social interaction positively influences knowledge management in intra- and inter-organizational structures. Communication starts with individuals and thanks to effective facilitation of communication in organization, individuals can initiate sharing and exchanging their expertise and knowledge (Ren et al., 2019). Knowledge generation and its dissemination depends on access to a wide range of communication channels. This can be found in Hoegl's research (2003) where he suggested that

individuals have a wide access to rich communication channels and through them are able to transfer critical information and knowledge at interorganizational level (Hoegl et al., 2003). Thus it has been observed that team level focus on communication methods and channels are vital to investigate organizational learning, According to further research based on Hoegl's concept that most of the valuable knowledge and information is processed informally by the individuals pertaining to smaller teams. Further, researchers proposed that organizational knowledge is created through combination and communication of individual learning among co-workers (Nahapiet & Ghoshal, 1998). Team's level of individual learning in the process is then intensified. Hence, recognition of team-level communication structure is indispensable to observe how knowledge is created for processes of learning that are developed in networks (Hoegl et al., 2003).

2.1.3 Facilitation through knowledge management systems

Knowledge has been named as a resource that brings competitiveness and advantages of the organization over different organizations. At the beginning of networks research, literature was based on studies regarding motivation and reasoning behind this collaborative arrangement from the perspective of appropriation and diffusion of one's organization's assets. It was discussed how knowledge can be shared within a network without the risk of asset devaluation for particular organizations (Beeby, 2000; Caughlan, 1999 and Nakura, 1997). Debates were among areas of accessing the knowledge to achieve common goals of members who are having convergent development plans and also process of internalizing one's knowledge to strategy or processes of the other. It disputes an aspect of conflict and knowledge boundary's setting in order to still maintain its competitiveness and avoid overwhelming dependency of other network members. Later networks were studied as an opportunity for development of the processes of learning where knowledge could be effectively created , shared and integrated, not necessarily focusing on content of the knowledge but processes that lead it to its creation, further distribution and the integration (Beeby, 2000). Ideas came from the need for collaboration where difficult access to knowledge or complex processes hinder technological and strategic advancement especially in a very competitive environment.

Organizational learning tends to encourage its members for knowledge sharing (Jones & Macpherson, 2006). Therefore, organizational learning in collaborative networks can be observed at multidimensional levels. Learning processes that are taking place in networks are heavily dependent on collaborative collective learning. Knowledge creation and its transfer is happening within relational processes that take place in networks. It is not individual and as per network perspective it originates from social interaction and it also retains within the network by evolving and updating between different members of the network (Gray & Schruijer, 2010).

Each member of the network generates knowledge in different multidimensional levels. That is due to certain development of the skills and knowledge possession. These human capital resources help to create new knowledge that would then need to be distributed across networks in an effective knowledge sharing system so that learning can happen at inter-organizational level (Jones & Macpherson, 2006). Building a learning system which is linked to social capital. As per previous researchers find that knowledge transfer is more efficient in more decentralized and flexible organizational structures, individual knowledge can thrive and take advantage of friendly environment to be exchanged. Formal knowledge transfer tools and channels are usually brought by introducing a meeting system and various communication channels where individuals not only share knowledge but also co-create it (Argote & Miron-Spektor, 2011; Fong, 2003).

Further research even focuses on reward system where knowledge transfer can be encouraged especially in projects-based organizations with multi-stakeholder systems where various multidisciplinary activities have taken place. This is due to the fact that individuals tend to work independently and with a strong task-oriented knowledge (Fong, 2003; Ren et al., 2019). However even though individual members serve as repositories of knowledge and social interactions and member-to-member networks facilitate knowledge transfer, potently research findings confirm that interorganizational structure hinder process of knowledge transfer as sometimes its complicated structure with various different geographical locations and different cultures. This is however not subject of this paper and it was only brought to depict complexity of interrelationships in knowledge transfer within interorganizational networks (Argote & Miron-Spektor, 2011; Beeby, 2000; Fong, 2003).Transfer of particular knowledge between organizations involves circular process of processing knowledge at individual level then transfer it within teams and then integrate it the way it can be served externally for organizations that are part of network or alliance (Fong, 2003).There is a distinction in type of knowledge where tacid is the more specialist individual knowledge that is far of more importance to organization and constitutes a high value strategic asset. Explicit knowledge is the one created in the processes of externalization where knowledge is codified and prepared for widespread distribution (Beeby, 2000; Fong, 2003). Knowledge integration in case of tacit knowledge (individual) is difficult as it contains specialist individual knowledge. Efficiency, scope and flexibility of knowledge integration is being discussed by Grant (Beeby, 2000). Efficiency provides understanding how cost-effective and able the organization is to access tacit knowledge and distribute it. Scope represents the size of specialist knowledge and ability of organization to integrate it. Lastly, flexibility demonstrates an idea of handling the knowledge in the way it could be adjusted and readjusted and then used to create new knowledge. These characteristics are important for organizations in order to use their own specialist knowledge to effectively extract parts of them and externalize them for the need of collaboration with other network members. It has been proven that explicit knowledge is far easier to integrate within inter-organizational networks than tacit one as per issues with individual member's assets value and appropriation matters (Beeby, 2000).

2.2 Learning Organizations for Sustainability

Learning organization has emerged as a concept to tackle complex issues in multiparty organizations a quite long one. Early work of Sange's (1991) and Pedler's (1989) paved the way for other studies on 'learning companies. By definition learning organization" facilitates the learning of all its members and consciously transforms itself and its context" (Pedler et al., 1989). Broader definition is proposed by Senge (1991) that aggregated more organizational and leadership sense. It is defined as 'organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free and where people are continually learning how to learn together" (Senge, 1991).

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Sustainability in a learning organization has a quite strong theoretical foundation however there is minimal literature available to analyze the practical aspect of application of sustainability to learning

organization. Main findings in research studies suggest that organizational learning functions as enabler to sustainability (Senge, 1991; Wilson & Beard, 2014) thus all models suggest for learning organization to apply derives from triple bottom line as there dimensional concept of economical (profit) social (people) and environmental (planet) considerations (Elkington, 1994)

Interesting example of developing a business model for retail was conducted by one of UK's retail chains Marks and Spencer's. Their aim was to bring sustainability development to their store operations by reducing energy and carbon usage.(Wilson & Beard, 2014) Study suggests a practical approach to application learning organization practices to aim specifically at sustainable problems, not strategic renewal or strategic management issues. This novel research allowed us to further investigate and narrow down this concept to interorganizational aviation networks for sustainability. However, M&S developed their own learning organization model, study suggested an explicit resemblance in Pedler's 11 areas of sustainable learning company concept. They are learning approach to strategy; participative policy making; information for understanding; formative accounting control; internal exchange; reward flexibility; enabling structures; boundary workers as environmental scanners; inter-company learning; learning climate; and self-development for all (Pedler et al., 1989).

Peddler's concepts developed as a learning company was one of the first foundation research to form an organization that learns sustainability. At the same time Senge (1991) emerged with the concept of 5 disciplines as a set of norms and practices shaping a model of learning organization. It consists of 5 disciplines of personal mastery, team learning, shared vision and mental models that were then wrapped around the fifth discipline of systems thinking. The depiction of learning organization model suggests that systems thinking is the final result of applying first 4 disciplines and the fifth disciplines complements the whole model and is interrelated with each 4 disciplines creating some form of umbrella where systems thinking is a connector to all. Wilson (2014) criticized the model as a purely conceptualized set of ideas that had minimal relation to reality of organizations willing to apply 5 disciplines in practice.

Although Senge (1991) did not focus his research work on empirical studies, Manring (2003) built conceptual frameworks and models heavily influenced by Senge's work. Salience of personal mastery, team learning and systems thinking was a cobblestone of research work on ecosystem management and sustainable approach to organization (Manring, 2007; Manring et al., 2003) Some disciplines were entered into the concept of shared learning, net-brokering role in networks, unifying purpose and voluntary and autonomous participation of stakeholders in learning organization. Different and more expected modeling was used as the learning organization was considered as networks that are active within ecosystem management. Senge's work was then used to further expand a concept of networks as a potential emerging learning organization.

2.3 Interorganizational networks as emerging learning organizations

Interorganizational Network learning can be treated as organizational learning in various ways. To understand how, let us first look at what an interorganizational network is, what interorganizational network learning is, and how it is similar to a learning organization.

Interorganizational network is a collection of organizations and the one that has been institutionalized (Manring, 2007). It is bigger than the individual organization or the summation of it, and the organizations work across boundaries (Manring, 2007). Interorganizational learning is the "learning in the context of groups or pairs of organizations that are proactively cooperating" (Croom & Batchelor,

1997; Crossan et al., 1995; Dyer & Nobeoka, 2000; Larsson et al., 1998; Levinson & Asahi, 1995, cited by Knight, 2002). This type of interorganizational network learning, according to Levinson and Asani, 1995, cited by Knight (2002), affects the characteristics of the entire network and that is how the institutionalization of the learning takes place.

Organizational learning is more than the sum of the individual learning or learning by groups who are the members of the organization and it impacts the characteristics of the organizations (Huysman, 1999, cited by Knight, 2002). Knight (2002) argues that 'network learning' is more than the sum of the learnings by individuals, groups and organizations of the network. Network learning processes affect the overall characteristics of the network (Dunford & Jones, 2000, cited by Knight, 2000).

Similarly, Probst and Buchel (1997, p. 17) argues that organizational learning requires interactions between the different individual members of the organization and is based on the connection of the individual members to the whole. Learning through network and within a network of organizations takes place through the interactions and discussions between the organizations (Probst & Buchel, 1997, p. 125).

A more extended approach has been taken by Manring (2007) to see interorganizational networks evolving as learning organizations. A learning organization is the organization that has embedded learning as a core element within the organization (Senge, 2006). All the five disciplines of a learning organization (more to be discussed below in section 2.3.1) have been found to be connected with the learning in an interorganizational network according to his study. To see the learning in an interorganizational network through the lens of a learning organization, the following are presented from the work of Manring (2007):

1. Personal mastery in the case of learning networks is present through the need of some "personal transformation on the parts of the individual members" (Manring, 2007, p. 329).

2. A shared vision is to be built by the individuals who compose the of the network that "transcends their individual organizational boundaries and fosters genuine commitment" (Manring,2007, p. 330).

3. Surfacing and testing mental models require the individual members to transcend their commitments to their own organizations and rather use their organizations as "essential vehicles" for reaching the goal of the network (Manring, 2007, p. 330).

4. Team learning is when the organizational members can divert from their organizational views and organizational learning into the collective view of the network and commit to collective learning of the network (Manring, 2007, p. 331).

5. Systems thinking in a network is when a systemic view is established throughout the network and the primary activities of the stakeholder organizations reflect the wholeness of the network (Manring, 2007, p. 332).

To understand the above disciplines, the researchers of this study intend to make a more in-depth understanding of the five disciplines of Senge (2006).

2.3.1 The Five Disciplines

Learning organization was a subject of studies by Senge (1991) that connected ideation of learning organization to sustainable development. That is encompassed in definition where learning organizations are organizations in which people continuously expand their capacity to create the results they really want, in which new and expansive patterns of thinking are nurtured, collective aspiration is set free, and people are always learning how to learn together"(Senge, 1991, p.45). Patterns, thinking of organizational processes as intertwining systems and high volume of multiple actor's participation in learning and organizing were the main connectors that could be observed in relation to sustainable approach (Han et al., 2006; Ramirez, 2012). Further research outlines sustainable learning organizations as spontaneous and autonomous mainly functioning on notions of voluntary knowledge exchange and idea of 'togetherness' (Han et al., 2006). Therefore, while in the past building a learning organization was an unknown venture towards building a learning organization, it is now clear in the present time that the five disciplines are the core factors that can help build a learning organization (Senge, 2006, p. 5). Senge (2006) argues that the realization of the capabilities of learning organization is what is motivating us to build the learning organizations. These five core dimensions of a learning organization are as follows:

1) **Personal Mastery:**

Senge (2006, p. 131) defines Personal Mastery as "the discipline of personal growth and learning". It is something that has a depth in terms of the development of people, as it transcends beyond skills and spiritual opening (Senge, 2006, p. 131). The foundations of reaching personal mastery are i) by being very clear to what is important to us, and ii) to be able to learn what the actual current reality of the context is, where learning means being able to achieve the desired results (Senge, 2006, p. 131). Personal mastery is essential because organizational learning takes place through individual learning (Senge, 2006, p. 129).

While analyzing data, researchers will focus on finding the following aspects of personal mastery in networks: Development of people at an individual level, areas of their development, and achieving the results through learning.

2) **Mental Models:**

Mental models according to Senge (1990) are sets of 'assumptions, generalizations, or even pictures and images that influence how we understand the world and how we take action'. Mental models pre-determinate how organizations 'think' and perceive the world that directly affects how an organization builds its vision. In the learning organization model by Senge (1990), mental models highlight two skills that learning organizations need to develop in order to handle mental models in an effective way. First of all is developing reflective skills which are helpful to indicate what mental models are existing in an organization and how they affect an organization's actions. It is important to analyze that as it might hinder other disciplines and prevent organization to fully practice learning organization concepts. Second one is related to conflict management and it demonstrates skills required to manage differences and disagreements while working on complex issues of the organization. Therefore, there is a need to find the way disagreements can be put aside and help to interact with other members of the organization while disagreeing.

When analyzing networks towards learning organization concepts, mental models will be used to track organization's following skills: ability to look back and reflect mental models specifically related to sustainability and also managing disagreements while dealing with complex issues.

3) **Shared Vision:**

Shared vision discipline is an attribute of learning organization that synthesizes all members of organization in the way that provides one consistent vision that is shared and believed by all. It provides a collective commitment to the organization's goals and interests finding systemic solutions that benefits all members of the organization regardless of structure. It needs to be agreed through a mutual consensus and holds 'a shared picture of the future we seek to create' (p. 245) It requires reference to future and innovation as the organization seeks to renew and find solutions to complexity. Then it needs a unifying, standardized vision that drives all members in the same direction for the future.

The success of this discipline depends on ability to apply generative learning in organization and lining up an organization's vision with the personal vision of individual members. Generative learning is a process where an organization creates and acquires new knowledge. It then promotes more innovation and experimental approach. It is beneficial for organizations that seek a solution to complex issues. Consequently, common, and shared vision is aligned with individual member's views and represents their personal vision. Therefore, learning organizations tend to shift a feel of ownership towards each individual member of the organization, making it shared equity.

When analyzing data, researchers will focus on finding following aspects of shared vision in networks: existence of shared vision of the future in organization's policy and objectives, examples of generative learning and individual vision's alignment with organization.

4) **Team Learning:**

This is the process of aligning the capacity of the members of a team and developing them in order to reach the common goal of the members (Senge, 2006, p. 217). The team learning within an organization can be explained in terms of three critical dimensions (Senge, 2006, p. 219). These are thinking about a complex issue through multiple team members rather than one individual, complementing each other when taking a combined action, and becoming a role model as a team to induce team learning among other teams. Team learning can be done through dialogue and discussion (Senge, 2006, p. 220).

While analyzing data, researchers will focus on finding the following aspects of Team Learning in networks: Use of collective potential in teams learning, the team-members' interdependencies for combined action, and inter-team role modeling.

5) **Systems Thinking:**

Systems Thinking is the domain that helps us to see the interrelationships between things and the patterns of development (Senge, 2006, p. 68). A long-term view is associated with the practice of systems thinking (Senge, 2006, p. 91). Feedback is one of the core elements in systems thinking and they can be both limiting factors and reinforcing factors (Senge, 2006, p. 73). There are two types of feedback - reinforcing feedback and balancing feedback (Senge, 2006, p. 79).

Reinforcing feedback on the feedback which helps in the growth of a system or adds to the grown in decline of the process (Senge, 2006, p. 79). Balancing feedback is the one which helps in the attainment of a goal (Senge, 2006, p. 79).

One of the ways by which the goal can be reached and stability can be achieved is to better identify and differentiate the delays (Senge, 2006, p. 89). Delay is said to have taken place when, according to Senge (2006, p. 89), "the effect of one variable on another takes time". There are also the systems archetypes necessary to understand the systems language, which are "Limits to Growth" and "Shifting the Burden" (Senge, 2006, p. 94). These are the processes of development for a period of time and then stopping and bringing short-term solutions to problems respectively.

While analyzing data, researchers will focus on finding the following aspects of systems thinking in networks: Limits to Growth, Shifting the Burden, Feedback System, Reinforcing Feedback, Balancing Feedback, Recognizing Delays in Feedback.

3 Methodology and Methods

3.1 Research Design

Research was conducted using inductive and qualitative methods in order to study phenomena of interorganizational networks and its capacity to learn as an organization. Inductive approach provided an ability to conduct in-depth research and also use the research results to make assumptions and suggestions as objectives of researcher's results (Silverman, 2015).

Qualitative method allowed to explore social interactions between stakeholders and use their narratives to build an insider impression of network members. The study focuses on interorganizational aviation networks and emerging sustainable learning organizations. Explorative approach allowed to gather more information on structures of networks that are established in order to resolve sustainability issues in the aviation industry. First, theory and concepts were brought to define networks and then looking into it from an inter-organizational perspective. Then organization learning was introduced as a core process to drive organization to solve sustainable issues. Next step was to bring the concept of learning organization in order to understand what criteria and dimensions need to be met for an interorganizational network to become a sustainable learning organization. Further in-depth analysis also permits to gain some insights on facilitation processes that are contributing to learning in networks. Collaboration, communication, and knowledge management systems were elaborated as main facilitating mechanisms in networks. This theoretical contribution enabled comprehension of those learning and organizational processes that support the network in becoming a learning organization.

Second part of the research was based on inductive work with interview data. This was used to answer two research questions: How do facilitating processes of collaboration, communication and knowledge management enable learning in aviation's interorganizational networks, and how can interorganizational networks for sustainability become emerging learning organizations? This was concluded by analysis of collaboration, communication, and knowledge management systems in aviation networks along with inductive analysis of the networks' learning practices. For understanding the learning practices of the networks, the learning networks were looked through the lens of a learning organization. The five disciplines of Senge (2006) was used as the framework to analyze the interview data. At the end suggestions and recommendations were synthesized followed by providing further research ideas.

3.2 Methods for Data Collection

Open-ended questions were formulated for the purpose of conducting semi-structured interviews. Semi-structured interviews were chosen by the authors to establish a proper guideline that would enable them to efficiently get the data needed to answer the research questions (Booth, Colomb & Williams, 2003, p. 87). Interviews were arranged with 6 respondents representing different stakeholders in aviation networks. The research work in this aspect was designed to gain more understanding of collaboration processes taking place in aviation networks, ways and levels of communication between various stakeholders of the network and how knowledge is being handled, managed and retained and finally shared in network premises. Additionally, questions explored interviewee's general sentiment to the network and provide depiction of roles, objectives and vision of networks that support research with valuable data on organizational structure and culture.

Interviews were conducted in the manner that allowed respondents to express their opinions and views without feeling pressured or directed in the biased way. Also, as (6 and Bellamy, 2012, p. 115) supports Morse et al. (2002), during the data collection process, the data and their findings were checked constantly against the aims and purposes of our interview protocol (6 & Bellamy, 2012, p. 115). This was done by constantly moving back and forth between the collected data, the theoretical framework that was established, and the design of the research, rather than collecting the data from the list of respondents in a mechanical way (6 & Bellamy, 2012. p. 115). This was done to ensure that possible errors were minimized during the collection of the data (6 & Bellamy, 2012, p. 115).

In this research, the questions were set in advance and an interview guide was constructed to ensure that the same questions were asked to the interviewees. The Interview Guide is shown in Appendix 1. However, the questions were changed slightly to match the interviewees' contexts and to ensure a more natural flow of conversation. Regardless, it was ensured that all the 3 areas (communication, collaboration and knowledge sharing) were given an equal amount of weight while extracting the information from the interviewees.

The respondents of the interviews were from different organizations within networks A and B. They had different functions within the networks which helped the researchers to obtain a broad range of perspectives on the topic of interest (see Table 1).

Table 1: Interviewee sample overview

Identification	**Network**	**Role in network**
Interviewee 1	Network A	Project Manager
Interviewee 2	Network A	Senior Adviser for Electrical and Bio-fuel aviation
Interviewee 3	Network B	Product Specialist
Interviewee 4	Network B	Sustainability Specialist
Interviewee 5	Network B	Fleet Development Specialist
Interviewee 6	Network A	Electromobility Manager

3.3 Data analysis methods

Thematic analysis was used to analyze the data. Braun and Clarke (2006) defines thematic analysis as the means to identify themes, analyze them and report them in data. It helps to "minimally organize" and "describe your data set in (rich) detail" (Braun & Clarke, 2006). Following the steps suggested by Braun and Clarke (2006), the researchers started to work with the transcribed data. The data was transcribed by recording it using a recorder and then transcribed verbatim using the software NVIVO. The transcripts were checked back multiple times against the original recordings to ensure accuracy. The researchers immersed themselves into the data by repeated reading of the. Narratives were made by the researchers during the reading process and meanings and patterns were looked for while doing it. Initial codes were then produced from the data. These codes depended on the theory-driven themes, meaning that the data was approached in a way that the codes were generated based on some specific questions in mind (Braun & Clarke, 2006). Time was invested by the researchers to code for as many themes as possible. Also, the entire code extracts were obtained by keeping a little of the associated data whenever possible, so that the context is not lost. This is to overcome the common criticism of coding regarding the loss in context (Bryman, 2001, cited by Braun & Clarke, 2006)

Document analysis was performed on one website of Network A. This was to be considered as primary data in order to provide a documentary version of studied reality (Silverman, 2004). Organizational documentation on the website allows to provide an analysis of definitions and formal organizational structure and reflect official objectives and mission for all participating members of the network. As this information provided in documentation in written manner reflect official stance thus are not considered the only source of objective data and were used in combination with interview data.

Next, the codes were sorted out into potential themes. Then the themes are reviewed and refined in two stages following the instructions by Braun and Clarke (2006). At first the combined data extracts for each theme were read and reviewed to check if they formed a coherent pattern. Next, it was checked if the themes for the entire sets of the collated data were valid and were accurate to reflect what the data set meant. Finally, the themes were defined and named, and they along with the collated codes along with the supporting quotes from the interviewees were visualized in a table. These themes were used to write down the narratives in the analysis section of this paper. A sample of the coding process is shown in Appendix 2.

3.4 Limitations of the Study

As the respondents shared their perceptions and experiences during the interviews, it was possible that some of these were affected by the current situation of COVID-19, which could potentially hamper findings related to the research questions. As the aim of this research was to provide a contextualized understanding of the respondent's' experiences and perspectives (Polit & Beck, 2010), it was made sure that sufficient flexibility was maintained during the thematic analysis while analyzing the data that was gathered (Braun & Clarke, 2006) to avoid confusion with the data biased due to the COVID-19. This was done by making sure that during the analysis, themes were carefully considered which were only in line with the context of the research aim (Braun & Clarke, 2006) and not with the ones that showed the effect of COVID-19, as some respondents touched areas about the effect of COVID-19.

Due to the situation of COVID-19, the sustainable aviation networks which were studied here, had been struggling with their businesses and organizational operations. As the dynamics of the work and communications started to take a different shape due to their transformation into online platforms, it was difficult to get in touch with the potential respondents for interviews. As a result of this, the researchers had to cut down our number of respondents to 6 from 10. However, the researchers still made sure that the interviews yielded sufficient data that helped the researchers to answer the research questions. This was done by building rapport with many of the respondents by communicating multiple times through email and over phone. Also, all the respondents sent back their signed consent to the researchers before

this research was published, which showed commitment of the respondents and the researchers on their parts.

Moreover, the interviews, which were supposed to have been done face-to-face, were done over phone or skype. This took place because of two reasons - the lack of proximity (as the respondents were from various parts of Scandinavia) and the issue of COVID-19 (for which social distance needed to be maintained for safety of all). However, proper communication was made sure by taking ample time from the end of the researchers to make sure that the questions were articulated very clearly by the interviewers before the respondents answered them. In some cases, the questions were repeated or rephrased to ensure that the respondent was sure about what was really asked. Interestingly, in some cases the respondents also asked if the ways they articulated their responses were understandable and would only proceed in the interview if the interviewers could grasp their previous answers. This informal communication helped to build trust between the interviewer and interviewee and ensured that the data were collected well. In other words, the barriers in communication that were caused due to remote and digital settings were overcome.

Furthermore, these networks which were studied were relatively new. Therefore it was possible that the potential interviewees were not familiar with technical terms or jargons that were used in the theory section of the thesis paper, including terms like “systems thinking” or “personal mastery”, due to the growth stage of the networks or the professional and educational backgrounds of the interviewees. To make sure that this did not impede smooth communication and collection of qualitative data, no such terms were used while formulating the questions in the interview guide. In fact, questions were even explained through repetition or rephrase during the interview when there was a necessity, as explained above.

3.5 Validity and Reliability

3.5.1 Validity

To ensure that the research is valid, the researchers ensured that there is internal validity. Internal validity means that the researchers must be measuring what they intend to measure (Neuman, 2011). To ensure that there is internal validity, the researchers created the interview guide carefully taking into account what they really intend to measure for the purpose of this research. They formulated the questions specifically related to the facilitating factors - collaboration, communication and knowledge management so that the correct responses can be utilized to produce results that would contribute to this research. In terms of the document analysis, the researchers were aware of the biases within the document and from the point of the researchers. According to Bowen (2009) and O’Leary (2014), thorough evaluation of the biases in documents and those in data evaluation of the researchers are essential to make sure that the research is credible.

3.5.2 Reliability

According to Silverman (2015), The term “reliability” refers to the degree that the findings of the research are not affected by any external conditions when the research is being conducted. In other words, a reliable study is supposed to produce consistent outcomes throughout the process of the research and if the same research is to be conducted in the same condition by another researcher, it will give the same outcome (Neuman, 2011). To ensure that the research is reliable, the authors of this research further took internal and external reliability into consideration.

The external reliability is the degree the measure is unchanged throughout the time of the study or how well the research can be replicated by another researcher. (Bryman and Bell 2011; Gratton and Jones, 2009). To ensure that this research has external reliability, the researchers did the setup of the interview at the end of the interviewee was comfortable in answering the questions. So it was articulated by the interviewer that the names of the interviewees will remain confidential, which helped him to respond to the questions as accurately as possible from his position. The consent has also been obtained from each of the researchers that the data is to be used for our research and the names of the researchers will remain confidential. This research also contains a chapter on methodology that describes the process of this research in detail, which will be helpful for other researchers to carry it out again. Furthermore, the authors developed an interview guide and practiced using it beforehand to make sure that they can converse with the interviewees smoothly and ask the right questions. This is because according to Flick (2007) and Silverman (2014) training of the interviewers and pre-testing of the interview guide can help in the interview process as it can help the researchers ensure that the interview questions are understandable.

The internal reliability is the degree to which the components of the gathered data are assessed in the same way throughout the research. This can be ensured by assessing the data by both of the researchers and agree on what is being assessed and its meaning (Bryman and Bell 2011; Gratton and Jones, 2009). In this research the authors ensured internal reliability by discussing the information obtained from the interviews and coming to a mutual agreement while analyzing and interpreting them.

4 Presentation of the Object of Study

Two networks were brought up for the research: they had been called A and B in order to ensure anonymity and prevention from various connotations. The idea of juxtaposing two networks was to see if approach of aviation industry that seek carbon neutrality and acted upon UN's SDG framework, was a universal or comparable in structure, values, strategy, and management of sustainability issues. It was an intention to explore as much of the aviation industry networks for sustainability as possible to enhance replicability of findings. Choice of these networks were purely dictated by direct opportunities to access them form researchers' residency in Nordics and access to aviation communities in Central and Eastern Europe. Two regions were used to explore how networks that were initiated just for a sake of sustainability are working and if the idea of sustainability and its implementation to the wider areas of aviation industry are based on similar values and vision. It was not researcher's intention to perform comparative analysis however after data was collected and analyzed, these two networks had some antagonizing characteristics due its geographical location, structure of its formality and stakeholder types.

Network A has a very formal structure of operations. It was formed as a type of organization with specific aims, goals, and objectives. Stakeholders were thoroughly analyzed and officially affiliated with network after effectuating shared value and vision through documented agreements. In contrast, Network B was initiated as an outcome of pressure from airline's departmental groups and external stakeholders to implement more sustainability-oriented strategy focusing on carbon-reduction initiatives. Network B's structure is unofficial based on strong ties with external suppliers and business partners with centralized decision-making body of executive team in the airline itself. Network is then built organically and without any officialized activities. Following section below brings more insight into main characteristics, background, and structure of these two researched networks:

NETWORK A: this network formally was founded in 2019 as a part of Nordic innovation development programs aiming at reducing the environmental impact of aviation mobility in Nordics. It's government-funded in the form of grant that is coordinated by non-profit governmental research organization.

Network consists of 17 different stakeholders officially partnered with the network, however members of different aviation networks are present and exchange information in intertwining manner. Its structure is decentralized however coordination and bridging relationships with different stakeholders are made via non-profit research organization. Its main objectives are:

- Standardize electric air infrastructure in the Nordic countries
- Develop business models for regional point-to-point connectivity between Nordic countries.
- Develop aircraft technology for Nordic weather conditions.
- Create a platform for European and global collaboration.

Decision making and funding: funding body- governmental entity

NETWORK B- this informal network has been initiated around 2018 in order to focus attention of major Central and Easter European (CEE) airline on sustainability implementation into their product and services offering. It had been founded by individuals working in the same organization that were concerned about lack of sustainability measures in their organization. It has very spontaneous and informal structure with many initiatives being conducted ad-hoc. Any contingent funding is provided in the form of additional budget supplement granted by the executive board of this airline. Members of this network are cross-departmental employees of major this CEE airline along with its suppliers, partners, and service providers. Main objectives are:

- Procurement that will be based on sustainable principles
- Implementing sustainability into airline's strategy
- Raising awareness of sustainable solutions among organization's main decision makers

Decision making and funding: airline's executive board

5 Analysis

In this chapter the research data has been analyzed and presented. The data was analyzed in two phases - 1 and 2. The analysis in phase 1 consisted of describing them in terms of the 3 facilitating factors - collaboration, communication, and knowledge sharing. For the analysis in phase 2, the outcome of the analysis from phase 1 was analyzed through the lens of the 5 disciplines of Senge. The analysis for both the phases are presented separately for each of the networks.

5.1 Facilitating processes and network's ability to learn

5.1.1 Collaboration processes

Network A

The objective of this collaboration in Network A was to speed up the accomplishment of the goal of sustainable aviation. Many of the network members in this network had already experienced working together in the past for other projects. This meant they already had the knowledge and experience of working with each other. There had also been inter-network collaboration between members of this network. Communication among the various working groups within the network had taken place and a sense of neutrality in the communication had been established. Hence the social capital was being

strongly utilized for the collaboration in this network. This supported the connection between the social capital and the network according to the theory of Borgatti et al. (1998).

Interviewees said the following which could be aligned with the theory of Coleman (1990), which stated that in a network the social capital was given more value when connections were explored, different group members were empowered in different ways, and new resources were given access to.

"(research organization) is also a very big, different departments we are about 3000 employees from many different research fields and many different competences and experiences so (...) we try to use our (...) organization here in electric evolution to see where can we help, and what competencies, do we have that needs to be like used to accelerate this development." (personal communication with Interviewee 6, May 2020).

"(research organization) is connected to all those projects and raise our hands and say that, hey, we have a lot of competencies and we'd like to help." (personal communication with Interviewee 6, May 2020).

The strength of collaboration was one of the things that the network members paid attention to from the very beginning as they had the joint goal of attaining sustainable aviation. As interviewee 2 said, *"The Nordic electrification of the electric aviation network came up last year. We had long prior to that identified regional and international cooperation as one of the potential drivers to speed up the transition to electrification of aviation."* (personal communication with Interviewee 2, May 2020). They had a common goal, understanding of their interdependencies that helped in the collaboration, willingness to contribute their valuable resources to reach the goal. This echoed the findings of Gary (1989) which stated that in the network where the stakeholders came together to achieve a common goal and were aware of their interdependencies, clearly had a starting point where they all connected together.

The level of collaboration of the members was decided autonomously and was affected due to their commitments to their mother organizations. Hence there was not equal or full engagement of all the members in this network. In this network some of the member organizations cooperate largely with the big players of the network as interviewees mentioned *"I'm going to call it cooperation with some of the big players here"* (personal communication with Interviewee 1, May 2020).

This potential attention to some particular big players still contributed to learning, as interaction within the collaborating network could take place within a single stakeholder party and could also take place leading towards learning. This supported the findings of Beeby (2000), Curseu & Schruijer (2018) that said that interaction must take place between the members to develop the solutions but it could also be that there was interaction with one of the members which could lead to learning.

Network B

Collaboration is in fact a crucial activity that can be observed in multi-party systems like networks. Network B's structure of collaboration is very open and informal. Network B by creating a sustainability role in their product department was a move to initiate cross-collaboration with other airline departments and also external stakeholders like partners, suppliers and service providers. In most of the time collaboration is a result of ones' departments issue to either understand or solve a problematic sustainability case. Gray (1987) provides an insight of this as looking for interdependencies and making each other aware who one can benefit from another. In case of the Network B sustainability department the airline is seeking help mainly in their suppliers to access knowledge and expertise. However, there is also an important reason for reaching out to external stakeholders' benchmarking. According to interview data, the sustainability department as a core stakeholder in this network is seeking information to build an effective sustainability strategy for their airline. That means they also wish to comparatively

verify compatibility of their sustainability actions with other industry players that they work with. Network B then uses collaboration to access industry insights and to seek new strategies. It is conducted in informal and infrequent fashion and it is entirely decided upon the department's needs. It does not have a policy or practices involving hierarchical decisions unless it involves budget decisions. It is worth indicating that sustainability is taken more as a background strategy element that intends to boost airlines image or better practices that lead to positive customer decision to choose their product *(personal communication with Interviewee 4, May 2020)*

Collaboration is also noted at teams' level within the airline's department. It uses the same principles of accessing information to uncharted areas of sustainability however seems to be established on intensity of social interactions and friendly unstructured, local, and easy-to-reach model. There is an example of collaboration between the product development department and sustainability department that is exchanged between two employees only: *(...) 'I found no difficulties in getting in touch with colleagues from other departments. Whenever we see such a necessity. Um. However, in most cases, as I said at the beginning of our conversation. All my, let's say, sustainability related projects comes from myself, and in most cases are handled, just by myself, and maybe with some assistance from my closest colleagues, within the organization'.(personal communication with Interviewee 3, May 2020)*

Collaboration seemed to be developing through the network at the airline's departmental level, and externally at partners and content provider's capacity. However, it still lacked a unified purpose and shared objectives that identifies interdependencies and drives mutual benefits. It seemed to be an understanding that the airline as a stakeholder was a new learner and initiator of a new sustainability strategy and is in position to seek industry data, reporting and trends. External stakeholders like suppliers, trade partners or content providers support to build awareness and understanding of the importance of sustainability and also provide a benchmark to other competitors. It served the purpose of building a stronger sense of business relationship that can lead to the airline's stronger dependency from external partners supplying sustainable products. Existing interdependencies were not yet firmly established and formed into a collaboration statement that potentially would help to clarify where each stakeholder benefits are and how to provide a balanced and healthy relation.

5.1.2 Communication as a main social interaction in networks

Network A

Connecting with the network members and sharing information was an obvious patronage among the network members. The following quotations from the interviewees of Network A support this fact:

"(...) we have the sharing of information as I mentioned before in (...) board…." (personal communication with Interviewee 1, May 2020).

"I think we have to share to succeed." (personal communication with Interviewee 2, May 2020).

"So (...) that's a normal day at my work also to do some product leading and of course I'm, I have to maintain communication with, with the other project partners." (personal communication with Interviewee 6, May 2020).

There had been two types of communication that had been discovered from the data collected - the digital and the in-person (face-to-face) communication. Digital communication was mostly used to

communicate among the network members and to share updates such as news with the world through platforms like twitter). The Scandinavian approach was helpful to communicate with the member organization. This was because it helped the members to reach out to each other whenever there was a need as there are no hierarchical, organizational, or institutional barriers to reach out to the members. This was reflected in: *"And that is also why these kind of networks are interesting for us, because it brings a lot of actors or a lot of stakeholders into the same room makes it fairly time efficient to deal with so instead of me having to call 12 different persons, you can sort of attend one meeting and discuss all of us so it's sort of Reduces transaction costs."* (personal communication with Interviewee 2, May 2020).

The example of active in-person communication was set through the in-person kick-off meeting at the beginning phase of this network. This was a meaningful meeting as essential elements of the collaboration of the network were discussed, such as how specific resources can be brought into the network, how the members would contribute, development of the work packages, etc. Later on, digital communication took place among the member organizations it helped to establish informal and flexible ways of updating each other, although the network leader deals with the strategic communication. Since there are multiple channels of communication, exchanging information and knowledge, and hence learning takes place effectively even if there are operational issues or uneven communication. Therefore, due to the individual initiatives of communicating, initially in person in the past and digitally at present, the overall communication across the network becomes easier (Ren et al., 2019).

"*In the most information sharing (...) is between members of (network) internally via email or (...) the program we are putting the information into in teams and that's the most broad information sharing…*" (personal communication with Interviewee 1, May 2020). This supports the theory of Hoegl (2003) of most of the essential knowledge being processed through working in teams.

Network B

Due to its size, Network B had a perfect opportunity to use direct communication to address information exchange and network's activities. It used standard ICT tools like Teams to connect with external stakeholders and it was more reliant on email for intra-communication with local organizations. It was worth noting that Network B did not have a common communication platform to address the network's objectives and activities, although the airline who was the central stakeholder of the network, facilitated communication that was going vertically to the executive team within the airline organization and also across other network members.(personal communication with Interviewee 3 & 4 , May 2020)

Social interaction looked at a very high level due to proximity of stakeholders within airline organization and interconnecting departments that work with the same external members as content providers, suppliers and business partners. This interaction was then a notion of quality that was needed in order to build and develop networks. Also, it was crucial to enable learning in organizations that were focused on solving sustainable issues (Hoegl et al., 2003; Nahapiet & Ghoshal, 1998).

Communication at the initial stage was well developed in separated organization structures within each of the network members. Although communication was not offered across the network in the way it provides standardized strategy or structure to let the whole network benefit from equal access to communication platforms and information exchange. (personal communication with Interviewee 4 & 5, May 2020) In Network B, communication was assessed as tolerable and access to communication tools easy however this communication was not coordinated by any specific stakeholder or member except the airline's sustainable department being more initiator of cross-departmental ad-hoc communication.

5.1.3 Managing Knowledge in Networks

Network A

At present there was no organizational learning taking place through knowledge sharing in this network. This was because although there was only team learning present focused on various work packages, there was no integration process to ensure that learning was taking place at the network level. However, this network had high potential to facilitate knowledge transfer as it was a project-based organization with multi-party stakeholder systems having various activities taking place. This was because in such a circumstance, the individuals in this network independently and with strong task-oriented knowledge, which was in line with the study of Fong (2003) and Ren et al. (2019).

Through the network, transfer of knowledge was also taking place as the organizations plan to take out the knowledge learned in this network and then taken out and applied at their own organization. This aligns with the literature of Fong (2003) which says that there was the circular process of knowledge processing from individual to team and then integration of it externally at the organization that was part of the network.

"It is in (...) good shape. And I think that's the main thing for us to take with us back home" (personal communication with Interviewee 1, May 2020).

The interviewee mentioned on multiple occasions during the interview about his interest to take the knowledge back home. On one of the occasions he exclusively mentioned that he was open to sharing the knowledge with the entire network, and also taking the knowledge back from the network and applying in his own organization. The statement was: "I will say both [open to sharing the knowledge to the entire network and taking it from the network and applying to his own organization] because (…) and myself was very open and transparent in all the things we're doing. So, I will absolutely say both." (personal communication with Interviewee 1, May 2020).

Process of sharing knowledge that was a part of network effort depended on network management. Sharing experiences and finding new ways of doing things by similar factors that contributed to the overall process with the help of this management process of the network was defined as learning in this network. This was good for learning as according to Beeby (2000) processes of creation, distribution and integration of knowledge was important rather than only the content for effective learning. The focus on the process of sharing and distributing the knowledge were evident in the following statements:

"The idea is that the entire network will be able to see (...) what is produced over our digital software. And, yeah, (…) I mean, also us as a, as a research organization working to, to make better for this week the society, we, we always try to share what we do." (personal communication with Interviewee 6, May 2020).

"… one of the work packages in the project is also to build a platform for collaboration also on the European and then beyond that good global scale where we can share our knowledge and we can also learn from (…) the rest of the world" (personal communication with Interviewee 6, May 2020).

Network B

Network's B knowledge management had few challenges as it lacked a proper integration and currently was not happening at network level. However, all interviewees expressed their desire to learn. Knowledge creation was limited to finding solutions that were just suitable to either one member or a cluster of related members like the product and sustainability department. There was an explicit knowledge that was often shared from external suppliers and partners back to the airline organization.

However, that happened in a very unstructured way and there was no knowledge sharing system or integration channel that would help the network to learn at organizational and network level. Data showed the sign of an emerging knowledge facilitator and integrator which was attempted by the sustainability department. There was clear evidence of problems with knowledge retention as due to high rotation in some departments sometimes activities were being done multiple times or expertise had been lost due to individuals leaving an organization (personal communication with Interviewee 5, May 2020). Although there is a one-way learning capability of the sustainability department that is gathering information and previous knowledge received from external organizations to intend to apply some of the practices and strategies into the airline's sustainability area. Also, all interviewed network members were keen to develop generative knowledge and really hope for possible to somehow integrate and share knowledge using a common platform.

5.2 Interorganizational networks as learning organizations

5.2.1 Personal Mastery

Network A

In this network there had not been much strong evidence of personal mastery. The amount of evidence that had been found about the area of personal mastery were mostly supportive factors that showed the practice of this discipline among the members. This was so because, putting the learning outcomes into context was one of the most important learning for the members. This related to one of the factors for learning organization according to Senge (2006) which was to be able to achieve the results through learning.

To support the above factor the following was articulated:

"But the most interesting part of learning from my point of view or our point of view, sitting in (...), and with me is sustainability background is how can the things be put in practice. That's the most important learning." (personal communication with Interviewee 1, May 2020).

The supporting factors for personal mastery according to Senge (2006) also included personal development in areas beyond spiritual opening. Multiple evidence had been found from interviews about personal realization regarding the importance of learning and how much he appreciated this opportunity.

"So, so for me it's both learning and adapting to this way of working together and. And, yeah, see like constellations (...) this (is) a chance to also understand new areas in detail that I haven't worked with before." (personal communication with Interviewee 6, May 2020).

"All the ideas (...) and the proposition is very welcome. And I mean that's learning to me but also an epiphany. Which is quite nice for me as a as a junior researcher, of course, like it gives you a chance to be innovative from the start, before anyone else says that this is how to do things correctly, which can often be the case in, in other areas or, or other sectors where, where the research has already been going on for a long time." (personal communication with Interviewee 6, May 2020).

Given the newness of the network, achieving the result and learning through it could come over time as the network will be more mature. This was evident from the following statement:

"I think that, in my case we are the beginning of this road. So the biggest projects are yet to come. Like the ones related to enabling connectivity on board, our aircraft. Therefore, it makes it quite difficult to assess current results of this, of this project." (personal communication with Interviewee 3, May 2020).

Network B

There were some aspects of personal mastery found among the individual members of this network (the respondents of our interviews). For instance, an interviewee was aware of what was important to him, which led to his individual development, something that was very essential and went beyond skills development or spiritual opening (Senge, 2006, p. 131).

This was shown through his clear understanding about what was important to him and reached out to his organization's partners when he saw misalignment of the goals regarding sustainability. For instance, when he found that there was a sustainability aspect being considered just to meet the underlying aim of greenwashing, he reached out to his organization and tried to fix it. He mentioned about it in the following:

"some of them [partner organizations that his organization worked with in the past] had (...) ideas which were not really sustainable so then I of course communicate openly that I find it greenwashing. Okay, so then they try to (...) accommodate my needs and try to find solutions that would be satisfying to me." (personal communication with Interviewee 4, May 2020).

The factors contributing to the discipline of personal mastery were visible from the interview data that the researchers got*:*

"I understand it [learning] as gaining experience. Working for an airline gives you opportunity to deal with various types of people's behaviors and different situations. At school we learn about basics and facts. Work on various projects teaches me dealing with people and how to adapt my "basic knowledge" to everyday challenges." (personal communication with Interviewee 5, May 2020).

As network B, just like network A was a new network, there had not been much opportunity for personal mastery based on the context of this network. However, the aptitude of this individual member of this network of reaching the personal mastery within his organizational context gave a positive clue that he had the potential to practice the discipline of personal mastery in this network, hence contributing to the process of making it a learning organization.

There were also aspects which were not in support of personal mastery. Although an interviewee mentions that he was open to learning, it does not imply learning at an individual level or personal growth. He states:

"So I do the research. That's my learning process. I try to talk to people that I believe (have) better knowledge than me." (personal communication with Interviewee 4, May 2020).

The same sort of limitation in terms of personal mastery was evident from the following statement:

"I am trying to get to know sustainability more and more, and I think learning is to get to know more information. For example, my basic source of knowledge are industry reports, trade reports, other materials provided by departments." (personal communication with Interviewee 3, May 2020).

5.2.2 Mental Models

Network A

Mental models helped achieve the network's A goals but also demonstrated a lack of proper strategy for managing different mental models in organization. On one side, electrification of aviation was innovative and considerably a new research area that required a lot of previous background theories in-use and mapping of some of the mental models that worked before in parallel industries like automobiles and railways industries (personal communication with Interviewee 6, May 2020). Senge (1990) elaborated that many organization's decisions are based not on ideas itself but also on how it makes sense to the world based on previous theories and generalizations. This set up assumptions and generalizations that led to the network's actions. In case of network A, most of the interviewees agreed with statements that teamwork and collaboration was important to development of set goals, and innovation was positive and necessary for greater development. It helped the network to meet their objectives.

On the other hand, like every other technology or industry, aviation networks strongly relied on existing theoretical foundations that are used to replicate or backbone the rise of new technology and progress. Research organization that was prominently present in the network holds a powerful and valuable research expertise. Interviewee 6 mentioned the importance of *'finding new ways to adapt what (I) already know from other fields into this entirely new area. And I see that there are many similarities on how to approach things like what I know for example, electrification of road vehicles that knowledge I can use into this field'* (personal communication with Interviewee 6, May 2020) Mental model of adaptability and looking back at the previous actions was evident and members of network A clearly used them to reflect and adapt. However, when analyzing abilities to find the way to manage disagreements that had been established due to different mental models within the network, it was hard to clearly highlight a collective strategy that was applied to the network's actions. Data showed a quite rough self-organization in terms of strategies how particular work packages were being handled and evaluated, giving a wide area of interpretation and authority to individual members. At this stage of network activity, it was hard to conclude if there was any strategy for managing disagreements or ways how to deal with different opinions or mental models within a network, however general assumptions could be made based on approach to hierarchy and structure of the organization. Interviewees mentioned that there was no issue with talking directly to high executive team members of the network. Interviewee 2 stated that there was no hierarchy within the network and culture is around direct approach to everyone regardless of title, calling *it "Scandinavian approach that we just call each other. No matter if you are a king or a lay man'* (personal communication with Interviewee 2, May 2020). Interviewee 2 also mentions that in case of any difficulties of concerns, the research organization member was facilitating and communicating it to project management that takes action. Although there was no official or apparent evidence of management strategy to handle mental models, it can be assumed based on interviewees' s reports on direct and personal relations with other network individuals, transparent and non-hierarchical work coordination and fairly small and local teams, network's skills to identify, reflect and act upon mental models and differences coming from them could be overcome and be turned into opportunities.

Network B

In network B, an ability to look back at different models and reflect on it, was rather based on future trends and current public demands. There was a mental model of thinking linearly about sustainability

and due to lack of mutual understanding on what sustainability is within the network, airline organization was getting very chaotic results based on different assumptions and generalizations on sustainability. It strictly focused on 'greening' the business with mental models of strict top-down approach to decision making. There was even a concern of sustainability department of the airline that executive team is 'green washing' in order to fit marketing agenda onto airlines branding *:' I mean, to be honest, like, some of them, not all of them but some of them had already ideas which were not really sustainable so then I of course communicate openly that I find it greenwashing. (...) so then they try to like to accommodate my needs and try to find solutions that would be satisfying to me'* (personal communication with Interviewee 4, May 2020).

Although there was no evidence to see if Network B was able to look back and reflect on mental models, it demonstrated signs of managing disagreements that were directly coming from them. Interviewees 3 and 4 stressed out that any concerns or issues towards either understanding or perceiving concepts or ideas are openly discussed both with departments related to sustainable solution projects like the product department and executive team. Externally, it was also observed that suppliers and partners were negotiating or providing extra information and adjustments to the ways of working or products offering. External members of network then provided a clearer disagreement solution and managed the difference in the way to mitigate it

5.2.3 Shared Vision

Network A

Network A provided a good example of a well-structured vision and mission path that was communicated and agreed upon with each member that officially joined the network. Due to the structured and organized style of this network, there was a classification and sorting of members that could officially join the network. While analyzing, two approaches were taken: information included and published on the official website and stakeholder declaration and data obtained from interviews with network members.

From the official website information, it could be observed that networks required 'active participation from players throughout the ecosystem of fossil-free aviation (Fossil Free Aviation, 2020). It also stated that network would *'co-create the future of fossil-free aviation'* and listed important features of its vision which were : Sweden's ability to have fossil-free domestic and international aviation at 2045, creation of local leading biofuel region that has global outreach and plan to export knowledge skills and technology out of network globally (Fossil Free Aviation, 2020). In the stakeholder declaration, there was a presentation of what network offered and its purpose. According to data provided, the network offered an *'active meeting place'* to *'collaborate and find ways towards new projects and solutions'*. It also reflected a need of future-thinking and its approach to innovation : *'we go ahead and show the way' ' create a region that is a global example, 'to contribute with good examples, knowledge and skills in a global arena, 'we see innovation as the key to solving complex challenges'* (Fossil Free Aviation, 2020)
Unifying and standardized vision that is mentioned as core for shared vision discipline by Senge (1991) is also visible in declaration, supporting also idea of collective goals and future building together: *'In order to cope with the change, everyone in the ecosystem around fossil-free aviation needs to work in the same direction, despite different individual inputs and objectives'* (Fossil Free Aviation, 2020)
Vision statement and stakeholder declaration were the same for a couple of projects that are being clustered together for various carbon reduction initiatives including Network A. It proved that networks in fact are intertwining and cross-collaborating.

Idea of one shared vision among interviewees seemed to be consistent with official documentation. Terms *'collaboration', 'international cooperation', 'sharing vision' 'active role', 'building future'* were appearing in the interviews and there was a general feeling that individual view and vision towards network goals and objectives ware reflected also at network level aligning official statements in stakeholder declaration (personal communication with Interviewee 1,2 & 6, May 2020).

In terms of building generative learning practices, interview data showed little evidence of these actions although generating and creating knowledge at the network level was the key message found in interviews as a concept and goal. As Network A is fairly new organization interviews mentioned about importance of *'setting our knowledge together to create a good picture*' (personal communication with Interviewee 6, May 2020) or *'creating some sort of knowledge base'* (personal communication with Interviewee 1, May 2020). However, it has been also observed that interviewees had awareness of not much of knowledge generated yet. Data indicated attempts to collect data and analyze them, sharing some of the previous knowledge and reporting some individual work done by network members. Therefore, there was identification and awareness of generative learning across all interviewed individuals although no evidence of knowledge was created already due to early stage of the network's activity and delays caused by Covid-19.

Network B

Due to informal structure of the network, shared vision was problematic to assess as there was no official documentation or strategy provided. Network acted more as a cross-departmental community supporting the cause of sustainability implantation combined with external collaboration with suppliers and business partners. This structure hindered ability to identify problems and interdependencies that were parts of vision creating. Although, based on interview data, it could be assumed that shared vision was not consistent across all network members. It appeared that every member had its own goal. Sustainability department pledged a need *to ' find solutions to make the product, more sustainable'* (personal communication with Interviewee 4, May 2020) and *to 'work with other departments to have like one idea that we can share in the world'* (personal communication with Interviewee 4, May 2020).Product department was focused on main operational tasks and sustainability project were side tasks of some derived activities around product development. Involvement of product development was needed to integrate a multiple feature of the product. From interviewee's point of view executive department's vision was to minimize cost of operation through sustainability and improve the 'green' image of the brand (personal communication with Interview 4, May 2020). External supplier's vision was to maximize profits through selling products of sustainability features and provide information and education on sustainability in order to build a string unique selling point.

Such a variety of different visions did not meet the concept of unifying and standardizing of vision that are collectively reflected in learning organization (Senge, 1991). It also did not refer to future related concepts and there was a lack of collective commitment to the same direction where the network organization can go.

In the area of generative learning capabilities, Network B mainly acquired new knowledge from the airline organization's sustainability department and external suppliers and partners that shared information and knowledge. Network used replicated knowledge that was shared from external sources to build their own sustainability solutions. It did not offer an innovation or experimental approach.

However, it created a learning environment for a new sustainability department and also other related network departments to renew the airline's strategy.

5.2.4 Team Learning

Network A

The enormous level of communication among the members of the network was highly facilitative in terms of team learning. This was because according to Senge, team learning could be established through dialogue and discussion (Senge, 2006, p. 220). Although there was in person meeting among the members only at the beginning during the kick-off, communication had still been a priority later, which was through online and digital. Communication to such an extent was remarkable because this network was newly established: "(…) is still in a start-up phase" (personal communication with Interviewee 1, May 2020). The formation of communication culture with the aim of supporting each other marked the importance that members focused on inter-dependencies and collective action of the team members – some essential ingredients of team learning. The following quotes of interviewees showed not only their openness to share among each other for team learning but also to set up mechanisms so that team learning officially and practically took place:

"To succeed, (...) sort of in the big picture, we need to cooperate, we need some kind of standardization and interoperability." (personal communication with Interviewee 2, May 2020).

"They [another partner] have been very positive but maybe we need to set up some kind of framework or agreement to, to use their data but they haven't said no or something like that, they rather think it's a great idea." (personal communication with Interviewee 6, May 2020).

Team learning in Network A happened organically. Since the members already collaborated in similar projects before and with other network organizations, there had been the practical evolution of team learning over time.

"I know from all our activities and of course there are also some new people there and organizations there that I have never met before. So it's a mix. For me, it's a mix. Okay, but I think I think I am no more or less 75% of all the other members." (personal communication with Interviewee 1, May 2020).

.*"And, and I mean the Nordic countries have worked before, and we are very good at working before together, and we're very innovative and I mean one vision of this in the network now is to, to create those standards that I talked about (...)"* (personal communication with Interviewee 6, May 2020).

Through the multiple connections with the multiple projects, the three critical dimensions for team learning according to Senge (2006, p. 219) had been referred to. The critical dimensions were the collective potential of the members of the network A, their inter-dependencies for taking combined actions, and inter-team role modeling. The meetings to check the progress among each other and the sharing of data among members based on work packages as mentioned by interviewee 6 were signs of the interdependencies of the team members and their readiness of supporting each other for collaborative action.

"And we (...) constantly seek to, to find those partners, internal or external to, to create more, as we said before all this solution so. So yeah, we always try to find several different functions to include in our bigger equation to boost the result in that way." (personal communication with Interviewee 6, May 2020).

"(…) it [Network A] has the potential to get better results if we manage to share experiences to coordinate in networks like this, okay." (personal communication with Interviewee 2, May 2020).

This echoed the fact of their knowledge of the importance of complementing each other to achieve the result.

Since the network was informal and had started recently, there had not been much evidence of teams being the model for other teams to follow the processes of team-learning.

Network B

Similar to network A, in this network there was a lot of emphasis on communication. Communication, for example in the case of one of the members, took place with stakeholders, both internal and external. Internal stakeholders that he communicated with included the finance team, purchasing, sustainability department, and executive board. His external stakeholders (outside of the network and the mother organization) included leasing company, manufacturer, and interior designers. His meetings took place both in-person and through digital media. During his interview, he mentioned about the workflow while talking about how the communication used to take place.

"Most of (the) people involved in my activities are on location. So I can meet them in person. It makes workflow much faster." (personal communication with Interviewee 5, May 2020).

Hence it was obvious that all these communications with the various stakeholders impacted his work. This showed that he communicated with the various internal stakeholder(s) in order to carry out the interdependent tasks, where the members complemented him, which was an important constituent of team learning (Senge, 2006).

As the member further stated confidently:

"My work has a direct impact on other activities of the airline. So it is an important part of whole operations." (personal communication with Interviewee 5, May 2020).

"Direct Supervisor is an experienced engineer who helps me every time I need it." (personal communication with Interviewee 5, May 2020).

This showed that the other members of the team were aware about his expertise and utilised it. This met another criterion for team learning according to Senge (2006).

Like Network A, Network B did not have the evidence of inter-team role modeling. Although interviewee 3 referred to working in teams, it was mostly between him and his team members from his mother organization. Of course, there was collaboration between him and the other partners of the network. However, clear evidence was yet to be seen of inter-team role modeling, where the other teams within this network would learn from his team within this network.

5.2.5 Systems Thinking

Network A

In this network, the members were aware of seeing the interconnectedness of things and patterns, which were essential for systems thinking (Senge, 2006, 68).

This was echoed from the following statements:

"So yeah, we always try to find several different functions to include in our bigger equation (...) to boost the result in that way." (personal communication with Interviewee 6, May 2020).

"...we can apply some of our expertise but to get that holistic or systematic view that we try (...) to create in our projects, we need other partners, and, and we need to set our knowledge together to create a good picture (...). So, I seldom work by myself. On the bigger like picture, and the projects." (personal communication with Interviewee 6, May 2020).

One of the network members implied in the interview that he was aware of what the current situation in this network and what was needed to be done as part of the next steps to reach the goal. This provided the essential feedback mechanism and showed the awareness of the dependencies between processes at the ends of the partners, which could be used in the future to demonstrate systems thinking in practice.

"Looking at the challenges we are looking into on airports, I think there's a lot of things that is developed and it's a good learning process to participate here because we are we we are able to clarify the most basic things that has to be in place before we can introduce electric aircraft in airports, all the infrastructure, all the the power power units you need and cabling and, and power sources and that kind of things should of course be sustainable, that kind of things." (personal communication with Interviewee 1, May 2020).

Change in attitude was also another area which can be gained over time through proper exchange of feedback. Continuous assessments needed to be done about situations that could determine learning. Such assessments could help in understanding where the member's action in the network at the moment and what pattern was being set.

"And I think that's the main thing for us to take with us back home. But also, of course, as the two producers are developing their products, the potential electric aircraft for the market, it would give a lot of learnings that we could take into into account and and to see how it could be compared with others and that kind of things because of course, with those two producers in the in the group, and that focus it gives, it means it's it's a very strong focus. But maybe it's not wide enough." (personal communication with Interviewee 1, May 2020).

Moreover, it was evident that feedback was needed to proceed forward with some of the steps. Feedback and delays, being essential parts of systems thinking, would need more time to be generated in a natural way. Since this network was new, in the future there might be potential for sufficient feedback through some delays.

"So we need to make some milestones of what we're doing. Around how we can convince. And we (are) who we (are), that's one thing, but (it is) the people and organizations and companies we need to convince. That's also difficult. Sometimes we have had the discussion will know weaken or assess, or broadens or other airlines in the Nordics be interested in this and when we have the discussions, they are interested but you know, it's not the decision maker from the top of the airline saying that we are interested, when they for sure can get the money back from the investments." (personal communication with Interviewee 1, May 2020).

"Unfortunately, I don't really know yet what will be the culture of this particular network." (personal communication with Interviewee 2, May 2020).

The following statement showed that the members were already aware of the importance of feedback, which they gained from their previous works as part of other networks:

"And if we look from one perspective, and our result is that, this didn't work. And that's also a result for us. If you're compared to a company that they, if their product doesn't develop as they wanted from the beginning, that's a loss that to us it's, it's, if we can say that okay this didn't work. Let's do the next thing." (personal communication with Interviewee 6, May 2020).

Hence it could be predicted that the members would be able to practice the generation of this feedback in this network in the future. The following statements about previous discussions and current mindsets showed that the members were future oriented, which was an essential part of systems thinking (Senge, 2006, p. 91).

"But this project or this network will be active for a couple of years. I don't remember exactly how long but for a couple of years, and we intend to be playing a more active role (...) in the future than we've done thus far." (personal communication with Interviewee 2, May 2020).

"And some organizations have also committed to work more on this than than others in terms of hours or in current work, so we had to stipulate how much in current work we will contribute to the, to the, to the project." (personal communication with Interviewee 2, May 2020).

Network B

Since this network was quite new as explained above, sufficient time had not elapsed in its operation where delay can be recognized, which could be done by observing the effect of one element or action within the system by another (Senge, 2006, p. 89).

This was evident from the following quotes of the respondents:

"…in terms of sustainability itself. I think that. So far I haven't completed anything significant. So, it's, it's too early to assess those results, as I said before." (personal communication with Interviewee 3, May 2020).

"This whole idea was so new that even the leading suppliers in the market. Didn't have ready solutions, or really sustainable solutions, like it was more about greenwashing but I can say it's getting better (...)." (personal communication with Interviewee 4, May 2020).

Feedback was another essential element of systems language. As there was no such process of getting feedback in the form of results yet, systems thinking was not being practiced.

The following statement showed the evidence of it:

"…but there's like no real support line, there are no, let's say meetings or any kind of gatherings or any kind of workshops that all of us could attend to really work and improve. And as I said there, there's so much missing information in the market that something's if it is other airline or the airport to say (...) it's a good, good way or not." (personal communication with Interviewee 4, May 2020).

Since there was no evidence of a feedback system due to the lack of a formal structure or strategy about communication or knowledge sharing through which the results of the actions could be assessed, systems thinking was hard to achieve at this time. However, the respondents were hopeful of becoming more open to learning at a network level. As a result, there was the potential to apply systems thinking as the network proceeded in its operation.

Another member was positive about the understanding and establishment of the feedback system at the network level. He recalled that in his own organization there had been issues when many people had the information about actions and results which were not communicated well due to a lack of structure or because they had those in their emails (which could not be shared later due to data protection policy). As a result, the people who joined later had to redo some tasks. This implied that the effects of the previous actions or patterns in the long run, which were parts of system thinking, could not be followed through. He used this experience to ensure from early on in the network level that there was a structure in this network where results and patterns can be followed through.

Talking about his own organization, he said:

"It is (a) big problem for long lasting aircraft leasing. As a lot of people have left , "non written" data disappeared. A lot of information could be found in old email but we do not have access to them anymore" (personal communication with Interviewee 5, May 2020).

*"People, especially newcomers, don't know how organization looks like, so they do not know who should be informed about their activities. It happens sometimes that some works are done double" (*personal communication with Interviewee 5, May 2020).

Later while referring to this network and the previous course of such experience in this network, he states:

"This matter is the overall problem in the organization I'm working at every level" (personal communication with Interviewee 5, May 2020).

6 Discussion

6.1 Ability of interorganizational networks to learn

This section of the paper answers the following research question:

RQ 1. How do facilitating processes of collaboration, communication and knowledge management enable learning in aviation's interorganizational networks?

Decentralized organizational structure

Networks in order to thrive need to have an open and decentralized system of structure (Beeby, 2000; Fodor et al., 2018; Thorelli, 1986). It is recommendable that each node and edge which represent a network's members and its connection with other members were as abundant as possible to ensure access to information and resources. In both networks operationally members have autonomy and free will on how and with whom they want to work. It gives an opportunity to also interconnect with their either social or organizational network that are part of an individual member's networking. Also, both networks take advantage of decision-making power that is tailored into their members needs of ensuring their objectives and goals. The only limitation to decision making structure is financial dependency from governing bodies. At some stage networks rely on funding from innovation programs established by governments or in the instance of Network B, shareholders and the executive team of the airline is deciding how much funding is assigned to sustainability projects. This means that at strategic level networks as a form of project organization or network organization are influenced by financial factors and also are coordinated and managed by members or members of a network that are either strongly connected to strategic entities or funding organizations somehow connected to the network. It is also contradictory to say that in order to initiate a network, some efforts to centralize activities of individual members of the network helped to shape member's ideas and agenda towards sustainability issues faced by the aviation industry. In most of the cases creation of sustainability- solving initiative at member level was achieved through centralization of sustainability projects or departments. These groups represent each member in a particular network. Therefore, decentralized structure at operational level enables and enhances networks to create knowledge, access information and connect with other networks to pursue solutions to sustainability problems. It then triggers organizational learning capabilities much needed to learning organization mechanisms.

Multi-party system approach

Multi-party systems are usually created in a business environment where the complexity of the issue or operations are at the core of the industry. It drives experimental and innovative mechanisms in organization and accelerates creation of solutions. Aviation is on the verge of technological transition and such a big integrated transformation is supported by networks. Both social and organizational systems involve many members which are connected in network through ties. Research and empirical data showed that the multi-stakeholder structure of networks allowed them to have fair access to knowledge, information, funding, and decision making. Networks were investigated in the context of organization and it was noticed that stakeholder engagement was intense and beneficial to organization as it provided a holistic approach and expanded the whole spectrum of organization's possibilities and competencies that are necessary to solve sustainability challenges. Networks also further benefit multi-party structure by ensuring its lack of limitation to different parties. Members of the network can grow and replicate indefinitely through its edges and ties which provide opportunity to create a web of learning communities. Such communities need a facilitator or integrator that was seen in both analyzed networks. It can be concluded that this function is needed to facilitate knowledge integration and information collation. It also works as a communication bridge that connects all members through. Research showed that this role of facilitator, integrator or sometimes called net broker can be held by anyone in the network and could be temporary however, it seems it needs to be a member whose focus on sustainability and neutrality in network relation is high. In both networks, the role of net broke was held either by the research institute or sustainability department.

Neutrality in stakeholder relations

Data investigated in the analysis section demonstrated that the level of involvement and strategies of various stakeholders in networks are very different. It was observed though that neither judgment nor corrective actions were provided by network management or other members. Each stakeholder had its own autonomous take on network collaboration and assessed potential of contribution they could make, time and staff availability and level of expertise. Such neutrality in networks, allowing different approaches and strategies to goal achieving and objectives reaching further enhanced open systems that enables learning of organization. During the analysis two different types of stakeholders emerged: commercial and non-profit. It did not appear in both networks however it proved that neutrality in network is visible through members with different goals where some unsatisfying results can be perceived by commercial stakeholder as failure but for non-profit organization is still an outcome and learning activity of things that just do not work. Either way neutrality ensured that both commercial and non-profit organizations had goals that either provide learning experience or motivation for further research and knowledge creation.

Multi-dimensional approach to communication

In various network environment an aspect of communication strategies can be either a support or hindrance to learning. Both researched networks had a different approach to communication strategies. Nordic culture of communication showed no existence of hierarchy for escalations or access to information or expertise, though it speeded up access to right people or right stakeholder. Network's B regional culture were less accessible to communicate with executives or limited to localized teams and hierarchy structure. However, there was not a one consistent strategy that was designed for networks to ensure effective and robust communication. It could be seen that use of ICT communication platforms were used for everyday information exchange and more important, strategic matters where discussed either by phone or in-person meetings. Some stakeholders built social relationship before joining networks as they cooperate with each other in different projects or they were linked with other networks indirectly. Different level of social interaction, various proximities among the stakeholders or regional culture impacted a communication at network level. It is recommendable that a multidimensional approach to communication and autonomous, self-organizing approach to communication is used. It then made different stakeholders to adapt easily to their own comfortable ways of communication they deemed as effective. However, such a liberal communication approach impacted network's B ability to stay informed and exchanged information about network's progress. Some information was not delivered to all stakeholders of interest or reached them with delay. Nordic culture of communication in network A suggested that assigning communication facilitator or integrator in network can improve communication preserving liberal and multi-dimensional approach to ways of communication at the same time.

Active network participation

Different stakeholders within industry acted differently in networks. They are interconnected to the root cause of the network, but they differ in terms of size, location and area of expertise. Sharing the same vision and agreeing on collaboration objectives looked like the only joint activities both networks are aligned with, leaving much more room to autonomy, and leading it at some level to self-organization.

Such a structure was supported by coordinated efforts that all activities made under the network were done with frequent and meaningful participation. Data showed awareness that the timeline can be different or the level of participation of each member can be changing or be not as intense as the rest of them. However, networks required to stay active even with minimal participation. There was once again a role of facilitator and integrator in network both in the form of a research institute or sustainability department as interviews showed that responsibility to ensure the network stayed active and with high level of engagement and participation. Also officializing and promoting active participation was visible especially in Network B where promotional materials, vision and stakeholder declaration were mentioned of active participation and active support.

Standardization through interdependencies

Idea of creating an open system network in order to solve sustainability issues, especially in aviation is problematic. The biggest challenge was to ensure a transformational strategy for global aviation standards, having a multi-party system with various stakeholders creating a learning network community. On the one hand a structure of a network must be open, autonomous, voluntary, and very independent from each stakeholder. On the other hand, transformational objectives that were set in aviation networks were to introduce a standardized system of electrification and to build an airline's strategy that is based on sustainable development. This is a contradictory approach where success depends on multi-stakeholder engagements and very open and minimally hierarchized management but also it involves a complex thinking to create a well synchronized and universal system. Networks still posed here as organizations and sought solutions to ensure these two are working well together.

It was observed that many individual stakeholders in networks tried to identify interdependencies and made a collaboration in the way as it brought the maximum collaboration effort possible. Strong interdependence awareness made stakeholders prioritize actions, keep themselves organized and reinforce common vision. It also minimized the need to seek more controlling management structure and rather kept them focused on work packages, creating knowledge collectively and then eventually learning at organizational level. However, there was also a risk to uneven collaboration that is an outcome of lack of official norms and rules for collaboration introduced in networks as one stakeholder can benefit more from the collaboration than the other, having stronger dependency. Standardization of collaborative work then is helpful to avoid such issues.

Facilitation and integration of knowledge at network level

An important role of facilitator and integrator has emerged in this research. Before in discussion, an important aspect of communication strategy and standardization were brought and how it was important to have a stakeholder in network who can act as facilitating body and integrator so that network can effectively work. Knowledge whether created or shared also needed the way to be managed in the way that network can potentially learn. Researchers noticed that uneven access to knowledge or incorrect collective learning can hinder development, delay learning processes, and prevent from achieving desired goals of networks. Therefore, it is evident that implementing an adequate facilitation and integration at network level would help and support network efforts to learn. Knowledge integration systems and its management through network broker or brokers is desired to facilitate the network's ability to create more knowledge, retain it within the network and transfer it across various stakeholders back to their mother organization.

6.2 Interorganizational networks as learning organizations

For both the networks, the disciplines of a learning organization in accordance with the five disciplines of Senge (2006) were in the process of development. There was not a single case in either of the networks where any of the disciplines were completely non-existent. In terms of the incomplete integration of these disciplines in the networks, the reasons that have been identified were - the recent formation of the networks and the most recent outbreak of a pandemic (COVID-19). But given the start of the integration is visible, the networks were seen as emerging learning organizations.

This section of the paper answers the following research question:

RQ 2. How can interorganizational networks for sustainability become emerging learning organizations?

Structure of the Network

The structure of the networks should be defined and agreed upon by the members. Formalizing the structure and institutionalizing the collaboration processes will help to officialize the set of objectives of the network, its mission, and its vision. It will thereby establish a 'shared vision' among the members. Such a formation of the structure and institutionalization of the collaboration processes can also help to set a strategy for the management processes. These would facilitate the practice of mental models as the members will be able to reflect back against the structured and institutionalized processes and content. Furthermore, as collaboration is institutionalized, it will define the framework over time through which systems thinking can be practiced.

For proper collaboration It must be ensured that appropriate depth, width and intensity are formulated for the members to carry out within the network. In terms of the process of collaboration, the problem setting, direction setting, and implementation should be properly implemented and monitored. If such calculated steps are taken in terms of formalizing the collaboration, then shared vision, mental model and systems thinking can be integrated in this network.

Communication

The existing communication channels that were proven to be useful for checking progress can help with such mental modeling if further reinforced. Such reinforcement can also help to cross-collaborate, and exchange information and knowledge across all organizational levels. It will also mobilize further information sharing processes among the internal and external stakeholders to institutionalize the exchange of updated information and foster systems thinking. As the individuals are able to better communicate with each other and process information and knowledge both formally and informally, team learning will be fostered.

Knowledge Management System

Knowledge management system needs to be developed in a way that would provide enough flexibility to the members to work on their personal mastery. They would then get enough space and infrastructure due to the existing communication and new collaboration levels as described above. It is particularly recommended to use formal structures in networks to operationalize collaboration processes more

formally. Through proper processes of collaboration, knowledge creating and knowledge sharing over time in an open and decentralized form, the members can practice team learning. This team learning will be indispensable for further knowledge creation and will help to find solutions at network level. As the collaboration, communication and knowledge management will be nurtured, systems thinking will inevitably take place among the members of the networks.

7 Conclusion

Aviation networks are ideal for investigating processes of learning, communication and collaboration that are key concepts of learning organizations. Naturally, aviation is the industry that is heavily standardized due to its global outreach and needs to be always aligned in a very systemic way to provide solutions to complex issues.

Networks are constantly growing net of relationships and interactions that exchange information and access various resources. Structure of networks depending on initial idea could be arranged formally being similar to multinational organization with matrix structure and with similar characteristics like project organizations. It also could be loosely arranged and resemble informal learning communities. Networks can be differently structured, but a vital principle is about finding one unified purpose and identifying problems to work together towards solving it. It should be always spontaneous and voluntary, so it naturally expands and allows abundant social interactions and its members engagement.

Learning organizations are not only organizations that learn but also implement ideas of complex thinking and holistic approach to problem solutions. Learning together at network level is needed to solve sustainability problems and using explicit knowledge of each stakeholder important to be integrated through effective communication and collaboration.

Theoretical and Practical Contribution

Building up on the limited research available to view or treat inter-organizational networks as emerging learning organizations, the authors intended to add new value regarding how the facilitating processes in aviation networks can enable learning and how such networks working towards sustainability can emerge as learning organizations. Given the fact that the previous research was limited, this research added new dimensions about how the collaboration, communication and knowledge management processes can help networks learn and how such networks can emerge as learning organization. By investigating the understanding and current level of experiences regarding collaboration, communication and knowledge management and how well these are connected to the framework of the fifth discipline of Senge (2006), the researchers added theoretical perspective to the limited research that existed in the field of learning network acting as learning organization. Moreover, as sustainability is an emerging topic itself, connecting the learning in the aviation networks with learning theory to move towards sustainability will be seen as a value-addition to the field of organizational learning. As the elements of the theory have been broken down and connected to the new findings through the detailed analysis in this research, dimensions about how to enable a network of organizations adapt the organizational learning theory and the facilitating processes to turn this network into an evolving learning organization was discussed.

In terms of the practical contribution, the detailed analysis in line with the breakdown of the elements of the theories can help professionals in this field to identify the conditions necessary to practice organizational learning in such networks. They will be able to utilize the findings and to formulate practical guidelines and incorporate them in their organizational policies and practices.

Recommendation for further research

As this is an inductive and reflective paper to explore phenomena of interorganizational networks that emerging as potential learning organizations due to its pursuit of sustainable development , in further study is worth to test some of the models that were mentioned in this paper and try to integrate some of the learning organization operational models with sustainability principles for instance of project management to see if building well- structured networks for the purpose of sustainability and control its structure and thriving culture will even more enhance effectiveness of implementing transformational changes in industries, technologies and systems towards sustainable development. Perhaps use this systemic and holistic thinking to examine the way institutions, stakeholders, partners organize themselves to cooperate towards joint solution finding, technology advancement and strategy renewal. It would be necessary to further investigate the potential of interorganizational learning to observe in-depth challenges and perspectives of network learning across different business sectors other than highly collaborative aviation.

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Appendix 1: Questions for Semi-Structured Interview

Before questions are asked, interviewers bring a quick description of their aims and what they are focusing on in their research study field. We also highlight the fact that they should answer the questions based on their experience of working with the network's goals and objectives and not their regular day-to-day job in their own organizations.

GENERAL

Warm-up/Intro: Could you please describe your organization and how you became a part of the network? What did you want to achieve through this partnership?

1. Could you please describe your main goals or objectives you have been assigned to do in the network project? (question to give the interviewee a chance to shape the data and to relate life examples to.

2. How can you describe in a few words what the network project is about for your organization? (Here the interviewee gives information in general on their feelings about the projects and level of attachment to the network and collaboration at an individual level.)

Sub question 1: Do you feel that the network is YOUR organization? Or is it a separate one from your own? Why do you think/feel so?

Sub question 2: Can you give an example when you as a part of the network have to work together as a unified team with common values/norms/practices that affected your work in any way? How did those values/norms/practices that you had individually or that you brought from your home organization affected the process and the outcome?

COLLABORATION, COMMUNICATION & KNOWLEDGE TRANSFER

1. Could you please describe how you work on your daily job activities?

Sub question 1: Do you work mainly by yourself or are you dependent on other partners in the network? If you are dependent, to what extent are you dependent?

Sub question 2: When you work in a team, does the team consist of members from your organization only or does the team comprise of members from various organizations which are part of the network?

2. In your professional field do you only work with the network partners that represent the same function or do you also collaborate with other functional areas, e.g. :sustainability managers or airline representatives, electromobility engineers, project coordinators etc.? (This question needs to be personalized and adjust it once we have a role background)

Sub question: Can you share an example?

3. How often do you meet with other network partners to share your job experiences, activities you have conducted and progress you made? Does this happen on a network level or is it reported only within your team and then passed on to other teams?

4. Do you have a chance to collaborate with all people you need in your processes in person or you need to use other methods of communication and information exchange like web-mail, e-conferencing, etc.?

5. To what extent do you believe data or results of your work are used towards overall project objectives?

6. What do you usually do when there is an issue or challenge and you need support?

Sub question: Who do you ask for help and how is the problem managed within the network?

7. How do you share your information and other resources with other network partners?

8. Do you have access to other partners' information, knowledge or expertise? If so, to what extent does it help you with your daily job for the network?

9. How are the findings, data or knowledge within the network project being shared with others? Do you have a shared repository, file-sharing software or documentation process that is shared with you, your team, your organization, or entire network?

10. What do you think about the challenges in exchanging information between different stakeholders in the project?

Sub questions: Depending on course of discussion, we would like to see if those issues with exchange happen at team, organizational or network level.

CONCLUDING QUESTIONS:

11. Do you or your organization participate in creating any project documentation, guidelines, recommendations? Is it used at network level?

12. So far, did you observe if any work you contributed within the network became a part of official policy, practices, or some sort of institutionalized guidelines?

Sub question 1: If yes, to what extent would you say it was done?

Sub question 2: If yes, what was the process of doing it?

13. How do you understand the term “learning”? What does learning mean to you in the case of the network project? What factors would you say affect your learning in this project?

Appendix 2: Sample of the coding process

Theme	Code
Collaboration	collaboration
	cooperation
	work together
	collaboration as a driver for accelerate transition
	regional and international collaboration
	levels of collaboration
	collaboration as accelerator in network
	teamwork
	inter-network collaboration
	collaboration as open system
	organic expansion of network through collaboration
	interdependencies in collaboration
Communication	information sharing
	impacts on communication
	neutrality in communication
	priority in communication
	communication channels and tools
	communication at different structure levels
	organization of communication
	active communication
	information exchange
	strategic communication and network leadership
	success factors for communication
	communication strategy
	communication tools
	individual approach to communication
Learning	learning
	knowledge sharing
	take our learnings from everyone and everywhere
	knowledge creation
	knowledge sharing
	knowledge standardization
	learning process in network
	knowledge management as holistic and systematic
	knowledge creation and its levels
	knowledge vs data information and results
	decision making in networks
	participation in networks
	participation in network activities
	autonomous decision making in networks
	network leadership