Examining shared leadership dimensions through a social network approach: a case from tourism industry

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Abstract

Background: Shared leadership is regarded as a fundamental approach to complexity leadership theory in terms of adaptability and flexibility. It emerges from communication among team members in a complex environment and consists of three dimensions: task coordination, personal support, and information sharing.

Purpose: This study investigates shared leadership and its dimensions which are task coordination, personal support, and information sharing using social network analysis. By incorporating social network theory, the social and relational aspects of shared leadership can be revealed and emphasized.

Study design/methodology/approach: Social network analysis was used to test the hypotheses on the data collected from the employees of a tourism organization.

Findings/conclusions: The findings indicate that the individuals in task coordination, personal support and information sharing networks have a medium or low percentage of degree centrality in the social networks of their units or departments. The social networks of task coordination, personal support and information sharing have a high percentage of degree density when all individuals are treated as a total network and individuals in different departments and units as separate networks. This situation is led by the more balanced distribution of the power among the actors, dense communication between the members and intense network relations in task coordination, personal support and information sharing networks.

Limitations/future research: The present study focuses only on internal network relations. As a future body of work, the study could be expanded to include both external and internal network relations to provide a wider understanding of the shared leadership concept. As another future body of work, to reach more generalizable results, this study can be expanded with a meta-analysis that will be performed on the results obtained by applying the survey on other organizations and processing the data collected with social network analysis methods again.

Keywords

shared leadership, social network, task coordination, personal support, information sharing

Introduction

Recently, researchers have mainly focused on complexity leadership as a new paradigm. Organizations require different perspectives, including rapid response and self-adaptation processes, in contrast to traditional leadership, which has deficiencies in overcoming complexities (Imperial et al., 2016; Kumar, 2020; Lewin, 1999; Plowman & Duchon, 2008; Xu, 2023). Complexity leadership has emerged as a solution to this problem. It is defined as an interdependent process

based on the collaboration of individuals to achieve the organization's common goals (Gichuhi, 2021; Lichtenstein et al., 2006; Wu, Cormican & Chen, 2020). According to this viewpoint, it is not only about authority and control, but also about encouraging decision-making participation through connection and integration (Rosenhead, Franco, Grint & Friedland, 2019; Wheatley, 1996).

Shared leadership is regarded as a fundamental approach for complexity leadership theory in terms of adaptability and flexibility (Clarke, 2013; Evans, Sanner & Chiu, 2021; Singh, Del Giudice, Tarba & De Bernardi, 2019). Shared leadership differs from traditional leadership perspectives in that it is viewed as a collection of social relationships based on task coordination, personal support, and information sharing (D'Innocenzo, Mathieu & Kukenberger, 2016; Hackman & Wageman, 2004). Similarly, social network theory recognizes and investigates social relationships among actors, which can be analyzed using social network analysis (Liu, Sidhu, Beacom & Valente, 2017; Yılmaz & Tuzlukaya, 2023).

The interconnectedness of individuals is at the core both for shared leadership and social network theory (Castellano, Chandavimol, Khelladi & Orhan, 2021; Liu et al., 2017; Uhl-Bien, 2006; Yılmaz, 2023). The network emerging as a result of the interdependent connections contains a high level of complexity. Therefore, leaders must be aware of complexities found in the network (Avolio, Walumbwa & Weber, 2009; Denis, Langley & Sergi, 2012; Rosenhead et al., 2019; Yawson & Jonson-Kanda, 2018). Despite the fact that shared leadership is based on the study of social relationships in a network, there are few studies that look at shared leadership through the perspective of social network theory. By incorporating social network theory, the social and relational aspects of shared leadership can be revealed and emphasized. Therefore, the current study investigates the relationship between network ties and shared leadership dimensions.

The rest of the article is organized as follows. First, theoretical background that includes shared leadership, social network theory and shared leadership dimensions is provided. Then, the methodology of the research is explained by focusing mainly on data collection and data analysis. The findings are also presented at the end of methodology section. The article is concluded by discussing and commenting on the results in the last sections.

1. Theoretical background

1.1. Shared leadership

Shared leadership describes the shared interactive power among team members in a complex environment (Döös & Wilhelmson, 2021; Hoch, 2014; Imam & Zaheer, 2021; Mendez & Busenbark, 2015; Shu, 2018). It is an interdependent and dynamic path taken by actors with the goal of guiding the organization to success (Barnett & Weidenfeller, 2016; Brown & Gioia, 2002; Gronn, 2002).

The studies that have been published in the literature to examine shared leadership include the ones that are listed as follows: The effect of shared leadership on team performance (Burke et al., 2006; Fausing, Jeppe Jeppesen, Jonsson, Lewandowski & Bligh, 2013; Hoch & Kozlowski, 2014; Xu, Ghahremani, Lemoine & Tesluk, 2022), team proactivity (Erkutlu, 2012), team effectiveness (Fausing et al., 2013; Wang, Waldman & Zhang, 2014), trust among the members (Drescher, Korsgaard, Welpe, Picot & Wigand, 2014; Klasmeier & Rowold, 2020), team development (Morgeson, 2005), organizational outcomes (Small & Rentsch, 2010), organizational effectiveness and performance (Nazir & Shah, 2014), individuals' creativity and innovation in a team (Dong, Bartol, Zhang & Li, 2016). The relationship between shared leadership and social capital is also revealed (Joo, Lim & Kim, 2016; Moore, Payne, Autry & Griffis, 2016; Zhang & Cheng, 2015).

Other studies on shared leadership can be also found in the literature (Love, Ika, Matthews & Fang, 2021). Erkutlu (2012) examined the relation between team proactivity and shared leadership by conducting research on 105 instances of teamwork in a commercial bank in Turkey. The findings revealed the positive impact of shared leadership on team proactivity (Siangchokyoo & Klinger, 2022). Furthermore, a meta-analysis approach was used to assess the effect of shared leadership on team effectiveness (Sinha, Chiu & Srinivas, 2021; Wang et al., 2014). The study discovered that team effectiveness correlates with shared leadership positively in organizations (George, Gibson & Barbour, 2022; Wang et al., 2014; Wu & Cormican, 2021). Drescher et al. (2014) investigated the relationship between shared leadership and teamwork in terms of trust. The findings revealed that shared leadership plays a prominent role in developing trust among the members and shared leadership has a positive

relationship with team performance (He & Hu, 2021). The impact of shared leadership on organizational connections was also examined (Mihalache, Jansen, Van den Bosch & Volberda, 2013; Zeier, Plimmer & Franken, 2018). The findings showed that shared leadership contributes to ambidexterity by empowering decision-making process, providing a collectivist approach and strengthening the flow of information among members. Another topic investigated in the literature is the relation between shared leadership and social capital. The findings emphasized the importance of leadership sharing among team members in increasing trust and cooperation among members (Han, Yoon, Choi & Hong, 2021; Zhang & Cheng, 2015). In this context, Hoch (2012) stated that shared leadership is a vital component to integrating members into their teams in organizations and leadership sharing empowers members' innovative behavior in the workplace.

1.2. Social network theory

A social network is a complex network of connected people, organizations, or other elements where connections are made and kept up through different kinds of interaction like communication, association, or common interests. These networks are the underlying framework through which information, resources, and influence travel, and they can appear in a variety of contexts, such as online platforms or actual communities. The social and professional dynamics of individuals and groups within social networks are shaped by the flow of ideas, support, and collaboration that social networks facilitate. Understanding how connections and relationships affect people's opportunities, behaviors, and decision-making processes in a particular setting requires a critical analysis of social networks.

Actors are viewed as embedded within social networks of interconnected relationships that provide them with opportunities and create constraints (Kenis & Oerlemans, 2008). When focused on the social network relationships between the actors, it is also necessary to examine the variety of purposes that various types of relationships serve (Kenis & Oerlemans, 2008; Woods, Galbraith & Hewitt-Dundas, 2019). In this context, two fundamental measurements can be listed as degree centrality and degree density. Degree centrality indicates how close the nodes or actors are to the center of the network. The individual who has the highest percentage of relationships is the most central one (Mayo, Meindl & Pastor, 2003; Tahmasebi & Askaribezayeh, 2021). Degree centrality can be calculated separately for individuals, as well as it can be formulized as a single value for the entire network by using the values calculated for individuals to provide an overview of the degree centrality of individuals in the network. In the second case, it is called network degree centrality or network centralization (Cao & Smith, 2021). Degree density refers to the current number of occurred links between individuals in the network and subgroups (clusters) divided by the sum of the number of links that have occurred and may occur in a network (Brass, 2022; Opper & Burt, 2021; Small, 2007). It mainly concentrates on the quantity of connections inside subgroups or clusters as well as between individuals in the network. It is determined by dividing the total number of links that have occurred and may occur within the network by the number of links that now exist between these entities (Brass, 2022; Opper & Burt, 2021). Given that there are more connections than prospective connections, a higher degree density value denotes a more intensive level of interactions between network actors. A higher degree density value indicates that the relationship between the actors in the network are more intense (Alberti, Belfanti & Giusti, 2021).

1.3. Shared leadership and social network

Studying shared leadership through the perspective of social network theory may offer a deep understanding of relationships because it concentrates on the social ties developed during the shared leadership process (Carter, DeChurch, Braun & Contractor, 2015; Shu, 2018).

Several studies have been conducted on the intersection of social network theory and shared leadership. This study is also interested in shared leadership based social network investigation. Carson, Tesluk and Marrone (2007) used social network analysis to investigate the relationship between shared leadership and team performance. According to the findings, there is a positive relationship between shared leadership and team performance.

Small and Rentsch (2010) also conducted a study using social network analysis and found that team harmony and member trust are important factors in increasing revenue. Members' interaction can be classified into three categories: task coordination, personal support, and information sharing. In a complex environment, interactions and communication among team members result in

shared leadership (Barnett & Weidenfeller, 2016; Clarke, 2013; Mendez & Busenbark, 2015; Pearce & Conger, 2003).

Task coordination refers to the connections and communication that occur during the completion of a task. Task coordination is required to lead individuals toward the organization's common goals in a synergistic manner (Susandy & Prasetyo, 2019; Wang, Han, Fisher & Pan, 2017). The breakdown of collectivism among members is unavoidable in the absence of task coordination (Wang et al., 2017).

Personal support is the most effective way to foster mutual understanding and strengthen weak ties. Personal support is based on actors' attempts to assist other members of the network (Kock, Mayfield, Mayfield, Sexton & De La Garza, 2018). Personal support allows actors to share knowledge and power, potentially resulting in a stronger network relationship (Kock et al., 2018).

Sharing information is also important for distributing power among actors and improving shared leadership (Szilagyi, 2017; Vandavasi, 2020). Information dissemination within the team, in particular, reduces the need for top-down decision-making hierarchy, distributes leadership power among actors, and facilitates shared leadership activities (Ali, Wang & Boekhorst, 2023; Szilagyi, 2017). In terms of communication and decision-making processes, a task coordination network is a decentralized organizational structure. It reveals who coordinates and collaborates with whom in a network to generate knowledge. The decentralized structure, distribution of tasks and related decision-making processes among individuals enable members to participate in organizational activities more collaboratively and to reduce their centralized positions. From the standpoint of a social network, the explained situation means that members' degree centralities should be low, respectively. Furthermore, it is reasonable to expect members to establish numerous relationships with others. The excess in the number of relationships results in a higher degree density percentage for the entire network as well as for subnetworks of each department. As a result, the first two hypotheses of this study are as follows:

Hypothesis 1a: *Task coordination generates a low percentage of network degree centrality.*

Hypothesis 1b: *Task coordination network has a high percentage of degree density.*

Organizations strive to create the ideal community in which members interact cooperatively and consistently in terms of who supports whom and how they support one another. (Susandy & Prasetyo, 2019). Personal support within the network demonstrates that the relationship between members is based on more than just tasks, it also helps to prevent weak nodes. From social network perspective, the explained situation means degree centralities should not be high because ties are distributed through the network. In addition, it is anticipated that members will form variety of bonds by supportive relationships. The variety of bonds results in a high percentage of degree densities across the entire network as well as within each department and leads to the following hypotheses:

Hypothesis 2a: *Personal support generates a low percentage of network degree centrality.*

Hypothesis 2b: *Personal support network has a high degree density percentage.*

The last dimension of shared leadership is information sharing, which represents the flow of knowledge and information among individuals as well as determining the information sharing network (Massari, Giannoccaro & Carbone, 2021; Susandy & Prasetyo, 2019). The explained situation implies that degree centralities in social networks should be low. Furthermore, it is expected that members will form numerous relationships with one another, resulting in high degree densities across the entire network. As a result, the following are the final hypotheses:

Hypothesis 3a: *Information sharing generates a low percentage of network degree centrality.*

Hypothesis 3b: *Information sharing network has a high degree density percentage.*

2. Methodology

2.1. Research design

The main aim of this study is to investigate shared leadership and its dimensions through social network analysis. Thus, social network analysis is used to reveal the actors' positions and degree densities of the related dimensions within whole network. A tourism-related organization with various departments allows us to conduct network research and answer research questions. In terms of their characteristics related to service industry, tourism organizations have highly complex structures. Also, all of the employees are fundamental and essential in the quality, production and delivery of services included in tourism sector due to its nature that requires social relations and direct contact with people for each

member of the organization (Sifolo, 2020). This situation also leads to distribution of leadership elements to organizational members instead of concentrating authority and power on the one hand, respectively. Therefore, a social network analysis in such an organization and its related departments can help to answer the hypotheses.

2.2. Data collection

Data for this study were gathered from the nine departments of the pre-selected organization. To do that, the following stages are observed:

a) To collect data, an ego-centric approach is used, in which each ego is asked to declare and describe his/her directly related contacts (Burt, 1984; Knoke & Yang, 2008).
b) Data was collected from 98 respondents.
c) In the survey, the participants were asked to declare their partners for task coordination, personal support, and information sharing.
d) Also, numbers of weekly contacts with declared partners for the aforementioned activities were asked.

The survey questions are as follows:

1. Which of your partners do you coordinate tasks with him/her regarding the work?
2. Which of your partners do you exchange information with him/her in the workplace?
3. Which of your partners do you get personal support or advice with him/her regarding the work?

2.3. Data analysis

Social network analysis is used for data analysis. To perform social network analysis, UCINET software (Borgatti, Everett & Freeman, 2002) is utilized. The variables measured are degree centrality and degree density. Each measured relationship is assumed as symmetrical.

Degree density is the ratio of total existing ties to all possible ties (Bruggeman, 2008). The resulting value takes a value between 0 and 1. If the degree density is close to 1, the density is high. The density of a network can give information about how quickly information spreads between nodes. A high value of density indicates that the actors are inextricably linked (Degenne & Forse, 1999). In this study, degree density values between 0 and 0.5 is considered as low.

Degree centrality, as Everett and Borgatti (2005) stated, is one of the fundamental analysis dimensions in network analysis. The degree centrality of any actor located in the network is calculated by the number of its connections, and is a significant criterion that can indicate the importance of the actor for the network. It is critical to determine which group the actors with high degree values belong to, as such determination can provide information about the number of network elements connected, the power of the actor, the degree of activity, and its importance. If degree centrality is high, shared leadership has a lower level (Hanneman & Riddle, 2005; Sparrowe, Liden Wayne & Kraimer, 2001). If the degree density value is low, shared leadership is at a higher level due to more homogenous distribution of the relations between actors. Degree centrality values can be expressed for actors separately, or it can be calculated as a single value for the entire network by using the degree centrality values of each actor in order to give an insight about the entire network. The degree centrality value of entire network can also be called network degree centrality or network centralization. In this study, degree centralities are calculated for the entire network as well as for each cluster (i.e., departments are regarded are subgraphs of the whole network). The number of weekly contacts with the partners is used to assess the strength of the relationships. For task coordination, personal support, and information sharing relations in the organization, social network maps are prepared and all the aforementioned parameters are calculated, separately. In this study, degree centrality values between 0 and 0.5 is considered as low.

3. Results

Through social network survey, answers from 98 out of 130 participants were collected from 9 departments. Table 1 and Table 2 provide some background information about the participants.

Table 1 Participant demographics

| Age	Number of participants	Years of experience
26-30	50	2-6
30-37	40	4-10
40-45	5	5-12
46-50	3	8-13

Source: the authors

Table 2 Departmental distribution of the participants

Department (abbreviation)	Number of participants
Management (M)	1
Assistance of management (AM)	1
Secretary (S)	3
Finance department (FD)	10
Human resources and personal affairs department (HRD)	18
Managerial employee departments (MED)	28
Maintenance and information systems (MIS)	18
Auditing and review department (ARD)	14
Accurate searches and development department (ARDD)	55

Source: the authors

3.1. Task coordination network analysis

Figure 1 shows the map of the task coordination network with clusters as departments including the degree of weak and strong ties. Due to the nature of their operations, the management, management assistance, and secretary departments are categorized as a single cluster.
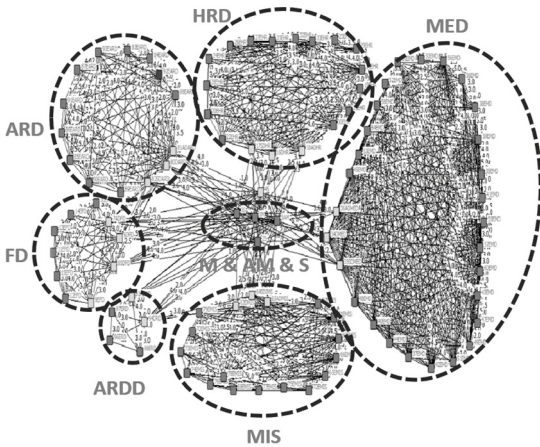
Figure 1 Social network map of task coordination network
Source: the authors

As shown in Figure 1, management and secretary departments are connected to all other clusters. The employees of auditing and review department, finance department, accurate searches department, maintenance and information department, human resources department, and managerial employee department are connected to other departments by their head of departments. Table 3 and Table 4 give the calculated network parameters.

Table 3 Network parameters of the task coordination network with symmetric relations

Parameter	Degree	NormDegree	Share
Mean	18.98	19.37	0.01
Std. dev.	6.64	6.77	0.00
Network degree centrality	13.70%		
Blau heterogeneity	1.15%		

Source: the authors

**Table 4** Degree density parameters of the task coordination network

Department	Degree Density
HRD	97.38%
MED	95.53%
MIS	100%
ARD	100%
FD	100%
ARDD	100%
M&AM&S	97.38%
Number of ties of entire network	1794
Number of possible ties of entire network	9506
Degree density of entire network	18.87%

Source: the authors

The network degree centrality of task coordination network is 13.70% and Blau heterogeneity is 1.15%. These values support Hypothesis 1a, which states that task coordination leads to a low network degree centrality. Also, degree density for the entire network is 18.87%, which is a low value. On the other hand, according to the shared leadership approach, individuals should be evaluated according to their specific roles in the network. If clusters (departments) are examined separately, degree densities are very high, 1 or very close to 1. The values for the clusters support Hypothesis 1b, which claims the social network of task coordination will have a high degree density value.

3.2. Personal support network analysis

Figure 2 shows the map of the personal support network with clusters as departments including the degree of weak and strong ties. Due to the nature of their operations, the management, management assistance, and secretary departments are categorized as a single cluster.
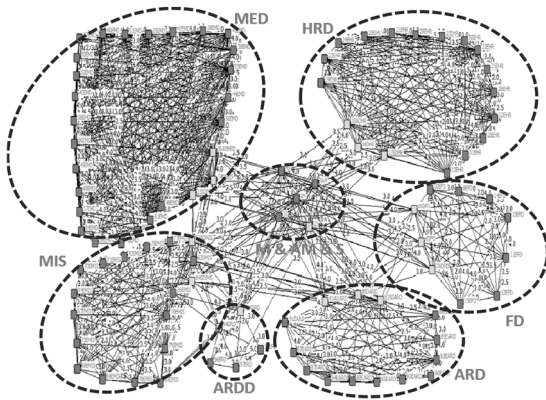
Figure 2   Social network map of personal support network
Source: the authors

As shown in Figure 2, management and secretary departments are connected to all other clusters. The employees of auditing and review department, finance department, accurate searches department, maintenance and information department, human resources department, and managerial employee department are connected to other departments by their head of departments. Table 5 and Table 6 give the calculated network parameters.

Table 5   Network parameters of the personal support network with symmetric relations

Parameter	Degree	NormDegree	Share
Mean	15.71	16.04	0.01
Std. dev.	5.92	6.04	0.00
Network degree centrality	17.14%		
Blau heterogeneity	1.17%		

Source: the authors

Table 6   Degree density parameters of the personal support network

| Department	Degree Density
HRD	87.90%
MED	74.11%
MIS	51.63%
ARD	69.23%
FD	82.22%
ARDD	100%
M&AM&S	100%
Number of ties of entire network	1501
Number of possible ties of entire network	9506
Degree density of entire network	15.79%

Source: the authors

The network degree centrality of personal support network is 17.14% and Blau heterogeneity is 1.17%. These values support Hypothesis 2a that claims personal support leads to a low network degree centrality. Also, degree density for the entire network is 15.79%, which is a low value. On the other hand, according to the shared leadership approach, individuals should be evaluated according to their specific roles in the network. If clusters (departments) are examined separately, degree densities are high, 1 or higher than 50%. The values for the clusters support Hypothesis 2b that claims the social network of personal support will have a high degree density value.

3.3. Information sharing network analysis

Figure 3 shows the map of the information network with clusters as departments including the degree of weak and strong ties. Due to the nature of their operations, the management, management assistance, and secretary departments are categorized as a single cluster.
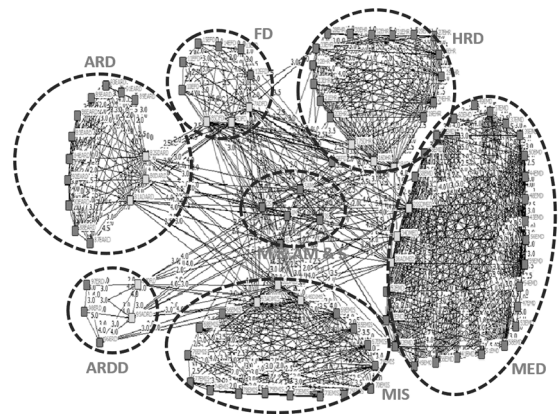
Figure 3   Social network map of information sharing network
Source: the authors

As shown in Figure 3, management and secretary departments are connected to all other clusters. The employees of auditing and review department, finance department, accurate searches department, maintenance and information department, human resources department, and managerial employee department are connected to other departments by their head of departments. Table 7 and Table 8 give the calculated network parameters.

Table 7   Network parameters of the information sharing network with symmetric relations

Parameter	Degree	NormDegree	Share
Mean	22.86	23.32	0.01
Std. dev.	8.99	9.17	0.00
Network degree centrality	35.93%		
Blau heterogeneity	1.18%		

Source: the authors

Table 8 Degree density parameters of the personal support network

Department	Degree Density
HRD	92.40%
MED	92.72%
MIS	100%
ARD	100%
FD	100%
ARDD	100%
M&AM&S	100%
Number of ties of entire network	1987
Number of possible ties of entire network	9506
Degree density of entire network	20.90%

Source: the authors

The network degree centrality of information sharing network is 35.93% and Blau heterogeneity is 1.18%. The calculated value supports Hypothesis 3a that claims information sharing leads to a low network degree centrality. Also, degree density for the whole network is 20.90%, which is a low value. On the other hand, according to the shared leadership approach, individuals should be evaluated according to their specific roles in the network. If we examine clusters (departments) separately, degree densities are very high, 1 or very close to 1. The values for the clusters support Hypothesis 3b that claims the social network of information sharing will have a high degree density value.

4. Discussion

Shared leadership is an approach that regards leadership as a distributed mechanism among the members to achieve organizational goals, compatible with complex leadership paradigm unlike the traditional view. According to shared leadership, leading power is shared among the actors. It emerges from interactions and communication among the individuals in the organization. These interactions and commination consist of three dimensions which are task coordination, personal support and information sharing. Despite the fact that these dimensions are shared with the network innovation concept and suitable to be investigated by social network analysis, such a study does not exist in the current literature (Avolio et al., 2009; Denis et al., 2012; Liu et al., 2017; Rosenhead et al., 2019; Uhl-Bien, 2006, Yawson & Jonson-Kanda, 2018). This research bridges the gap by applying social network analysis methods to shared leadership dimensions.

The findings of this study reveal that each individual in task coordination networks, personal support networks, and information sharing networks has a medium or low network degree centrality. The reason for the given situation is the distribution of the relationships among the actors instead of focusing on specific members. Furthermore, degree densities of clusters of task coordination, personal support, and information sharing networks are high. The high percentage is led by dense communication between the members. Moreover, strong ties are observed as the dominating ties in these networks due to intense relationships.

The network degree centrality values of task coordination, personal support, and information sharing networks are lower than medium. The network degree densities of these networks are low across the board, but they are high within each cluster. When nodes can participate in network innovation through their clusters, lower degree densities for the entire network are expected, but higher densities for the clusters. Furthermore, due to stronger communications and interactions arising from shared leadership processes, the ratio of strong ties to weak ties is higher in all of the aforementioned networks.

Conclusion

The present study fills the given gap and contribute theoretically and methodologically by implementing social network analysis into shared leadership concept. Additionally, dimensions of shared leadership are examined and revealed with social network analysis as another contribution of the present study.

The present study has also some managerial implications. First, the quality and density of communication among clusters of the organizations may be increased in order to develop the percentage of degree density. Second, the relationships and power can be distributed more evenly instead of concentrating on specific actors and clusters. In this way, coordination among the members will be empowered, personal support will increase and information will be disseminated within the organization. Therefore, organizations can be able to benefit from the advantages of sharing leadership explained in the literature (Drescher et al., 2014; Erkutlu, 2012; Fausing et al., 2013; Imam, 2021; Spedding, Brough, Hawkes & Chan, 2023; Wang et al., 2014) such as higher performance, more collectivism, increased trust, and higher effectiveness. Tourism organizations, due to their uncertain and complex environments, always searches for best solutions and adaptations. The results of this study provide that, it is

significant to integrate the shared leadership for achieving the pre-defined goals and objectives. Specifically, for survival in such environments, tourism organizations can benefit from shared leadership and can agree upon such characteristics as empowerment, engagement, support and so forth.

With the present study, the shared leadership dimensions and their reciprocals in social network theory can be investigated and analyzed. On the other hand, the present research focuses only on internal network relations. As the future work, the study could be expanded as including both external and internal network relations to provide a wider understanding of the shared leadership concept.

This research has some limitations, on the other hand. Social network theory and its analysis methods have different approaches than traditional and statistical methods (Sözen, 2012). Unlike statistical methods that aim to produce valid and generalizable information for the entire universe with the data collected from a limited number of universe samples, the sample data collected for social network analysis directly constitute the its own entire universe. Therefore, social network analysis, which draws a general framework in this way, recreates its own universe within each network definition, again. Although this situation limits the generalizability of the results, it provides researchers with higher level of insights. As another future work, in order to reach more generalizable results, this study can be expanded with a meta-analysis that will be performed on the results obtained by applying the survey on other organizations and processing the data collected with social network analysis methods again.

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