

The Power of Networks: A Pre-Requisite to Social Network Analysis

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Abstract

Social network analysis has attained significant attention in recent times. It is a contemporary data mining technique which maps and measures social structures using network and graph theory for people analytics. A pre-requisite to social network analysis is to explore the network genesis and evolution. Most social network studies in the past have focused primarily on the impact of social networks on employees but no evidence has been found in the referred literature which identifies the reasons why employees bond with specific network members in the first place and what are the types of workplace social networks. Hence, the aim of this study is to conduct a systematic literature review for identifying the reasons why specific workplace social networks exist, classify types of workplace networks and highlight network ties which are beneficial for achieving organizational goals. By employing social network theory, this study investigates the intra-organizational networks of corporate business environment. Multiple databases were used to extract relevant papers for this review such as Science Direct, IEEE Xplore, Scopus and Web of Science databases and Directory of Open Access Journals. Some of the major trends identified from the 48 past papers included in this review are: (1) the nature of employee interdependency determines the type of social network created; (2) strong and weak ties both are beneficial for fast information diffusion; (3) negative ties have a stronger impact on organizational outcomes than positive ties. This review will provide a new broader conceptualization of social networks and its influence on employees.

Key words: Network genesis, tie strength, types of networks, knowledge management, and data mining.

1. Introduction

Workplace social networks or intra-organizational networks are essential elements of an organizational life. Who you know, how you interact, and the frequency of interaction all contribute toward creating specific workplace social networks [1]; however, no matter what type of social networks exists in organizations, they all have an impact on shaping an organization's culture, employee performance and productivity of the company. These networks are usually hidden and deeply embedded in every organizational hierarchy but they are not reflected on formal organizational charts [2].

Numerous authors have described intra-organizational networks based on their specific characteristics such as [3] and [4]. Fritsch and Kudic [3], suggests that characteristic of every organizational network greatly differs from each other in terms of interdependency of employees. Knowledge networks are created for sharing information [5], friendship networks are created for emotional support [6] and advice networks are developed for mentoring [7].

To extract the relevant articles, multiple databases were explored such as Science Direct, IEEE Xplore, Scopus and Web of Science databases and Directory of Open Access Journals. After a thorough literature search, 48 relevant papers have been identified on network genesis of organizational networks published between 2000 and 2021. Majority of the papers cited herein, have focused on investigating different types of employee networks. For example [8] and [9] have explored the advice networks centrality of employees for their extra role behaviors, [10] discusses Guanxi network ties in China and [11] explored workplace friendship networks.

Few of the studies included in this review have also shed light on the insights of employee intra-organizational network and discussed various reason for employee interaction such as [12], [13] and [14].

Some studies have suggested that ‘Organizational social networks’ (OSN) help in fast information diffusion of internal and external knowledge among employees and has a positive substantial influence on employee productivity [15]. Internal knowledge is created by the organization within itself whereas external knowledge come from the outside source [16]. Several other authors have emphasized how social relations play a significant role in information diffusion using social contagion and persuasion e.g., work done by [17], [18] and [19]. Social networks help in creating business strategies, value creation and making strategic alliances [20], developing relationships among peers [21] and [22]. The general belief in literature is that social relations are a mean to facilitate social exchange by knowledge sharing, value creation and employee development.

Although there is a vast body of knowledge on social networks literature, majority of the studies in this realm have focused on how the network structure and the communication pattern influences an employee’s behavior [10], [23], [24]. While this may accentuate one facet of an organizational network research, it does not fully comprehend the functional characteristics of these intra-organizational networks such as the micro foundation and the genesis and evolution of specific workplace networks. Any comprehensive review which coalesces the above-mentioned network characteristics has not been found and presents a gap in literature in this regard.

Since, workplace networks are the true indicator of how information flows across different departments, by gaining a deeper insight into these networks, organizations can benefit by promoting those networks which are constructive and aid in achieving organizational goal and inhibit those networks which cause hindrance in the organizational success. Owing to this context, there is a great need to investigate why do employees interact with each other and how different workplace social networks are created in organizations. To address this issue, this paper aims to provide a systematic review for presenting the current state of organizational networks literature and identify which networks are more beneficial for the organizations. The present study will contribute towards the existing literature by:

1. Identifying the reasons why employees form specific social network ties in organizations?
2. What are the different types of social networks which exists in organizations?
3. What are the important networks which are beneficial for achieving organizational goals?

The rest of the study is organized as follows. The next section starts by discussing research method in section 2, results and study setting in section 3 and 4 followed by insights of organizational social networks in section 5, then types of workplace networks are discussed in section 6. A detailed discussion on strength of ties and positive and negative ties is discussed in section 7 and 8, theoretical inferences in section 9. Whereas the overall conclusion and discussion has been explained in section 10.

2. Research Method

For this paper, Kitchenham [25] systematic review procedure has been adopted. To identify the most relevant research papers, a review protocol has been followed to narrow down the literature search by first elaborating the method employed to sift the data base for relevant articles and then defining a review criterion. Multiple databases were used to find the relevant literature for our study. Only state of the art and significant contributions have been considered in this research domain. The following key syntax search was used independently and in combination for sifting through the data base.

‘Organizational network analysis’ and ‘Knowledge Management’; ‘Types of Networks’; ‘Network Genesis’; ‘Tie Strength’; ‘Social Network Analysis’ or ‘SNA’

After identifying the relevant publications, reference section of the selected papers was also scanned thoroughly for any other significant papers to further refine our scope for this paper.

2.1 Review Criteria

For this review paper, the following inclusion criteria for past papers has been adopted if: (1) intra organizational network characteristics were examined; (2) network evolution was discussed; (3) intra-organizational networks were explored in context of employees; (4) papers published in English language; (5)

literature published in last 20 years (January 2001-December 2021). It was during this time; organizational networks were researched most frequently in human research and management studies. Any research papers not meeting these criteria were excluded. For the initial search, the key terms of this research were searched for in abstract title and after identification of eligible articles, complete manuscript was scanned for fulfilling the research criteria.

2.2 Study Selection

Following the review criteria, an initial literature search of data base returned a total of 12,341 papers. The articles were then examined for the titles and abstract and only those papers were shortlisted which matched with our study goals. A total of 238 paper were shortlisted after the initial screening, which were further scrutinized for full text. After an extensive full study, a total of 48 paper were finally identified fulfilling our review objectives of intra-organizational networks which were then included in this review. A breakdown of the literature search is presented in below Figure 1.

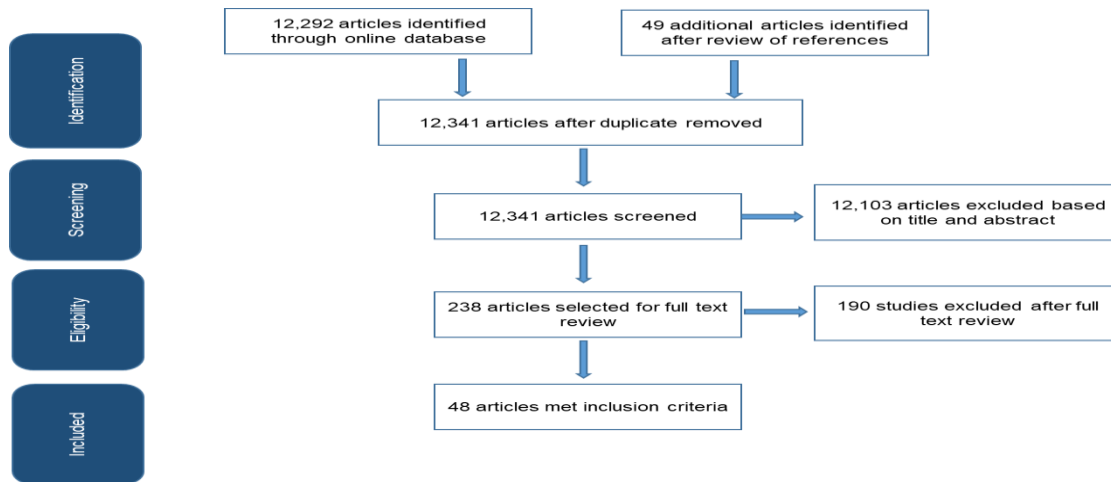


Figure 1. Study selection

3. Results

The total 48 papers identified after an extensive literature search provides a deeper insight of the fundamental drivers of workplace networks by accentuating on the micro foundation and the genesis and evolution of organizational networks. The four most common topics discussed in literature were a). Intra-organizational networks-why they exist (n = 9); b.) Types of organizational networks (n= 32); c). Strength of ties (n=7); d). Positive and negative ties (n=5). Majority of the articles reviewed primarily focused on the different types of organizational networks i.e., friendship network, advice network, work and collaboration network, knowledge network and avoidance network. However, there were very few articles on knowledge networks (n=3) and avoidance networks (n=5). Most articles (n=28) were published between the year 2015-2020, whereas few articles were published in previous years (n= 12 from 2000-2008 and n= 8 from 2009-2015).

Literature suggests that [26] has the maximum number of citations for insights on intra-organizational network, [6] are greatly acknowledged for their work on friendship network, [27] for advice and work network, [5] and for knowledge networks and for avoidance network [28] has the greatest citations. Whereas for strength of ties, [29] is the most prominent author in this domain and [30] has significant contribution for positive and negative ties. On the whole, the key authors who have maximum contribution in social network studies is [31] and [2].

4. Study Setting

Most of the papers on organizational networks (n=18) were carried out in context of USA. Several of the studies were conducted for exploring social networks of employees across different cities of the same organizations, while others primarily focused on same bounded location of the employees. Rest of the studies

were conducted in different regions such as 2 in South Asia (1 in Singapore and 1 in Thailand), 10 in East Asia (6 in China, 3 in Taiwan, 1 in Korea), three in Europe (1 from Hungary, 1 in Italy and 1 Netherland), 3 in Australia, 1 in Turkey and 1 from South Africa. Few articles did not mention the region of their study, rather research and development department (R&D) was mentioned in their data collection methodology.

After an extensive literature search of the database, four trends emerged while sorting the articles included in this review, which are presented below.

5. Insights of intra-organizational social networks: why they exist

Studies in this category have discussed how intra-organizational network emerge in the first place. Scholars and researchers have been investigating these workplace networks by employing organizational network analysis (ONA) using network and graph theory by representing nodes and edges as seen in Fig. 2.

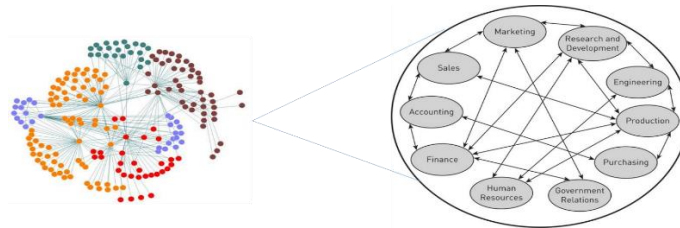


Figure 2: An example of Intra-organizational networks across different departments

Fig.2 shows how a complex organizational network look like when employees of different departments interact with each other on daily basis. However, such networks are usually invisible and are not quantified on firm's organizational chart. Burt [1] states that these intra-organizational networks allow the individuals to branch out from their formal organizational hierarchy and connect with their peers voluntarily.

Fatima Dehbi [12] argues that employees in every organization co-exist with others for carrying out day to day tasks. They interact with each other at all hierarchies either for seeking advice [8], work related queries [26] or for information sharing [32]. These workplace interactions form their specific intra-organizational network. More specifically, the concept of intra-organizational network is defined as the cumulative interaction between members of an organization.

Literature reveals that employees form specific workplace social networks for various reasons. One of the main reasons for employee interaction is information and knowledge exchange. Social networks help in knowledge management by transmission of explicit and implicit knowledge [33]. Oseledchik et al., suggest that both these kinds of knowledge exchange are valuable for an employer as well as an employee for their growth and development. Individual's make use of this knowledge exchange to discuss, share ideas and seek help with their specific network member, to accomplish their tasks more efficiently.

Gusmerotti et al., [13] states that these invisible networks also help the employees to communicate with each other more effectively apart from formal communication networks such as email and phone. It creates a timely and uninterrupted communication which helps the employees to understand the role and job responsibilities of their peers in other teams, creating a sense of embeddedness and increasing employee satisfaction. Organizational social networks open up new channel of communication for the individuals.

Another reason for the formation of these organizational networks is discussed by [34] who suggests that intra-organizational networks are developed to engage and build relationships with the colleagues. The authors elaborated that team leaders always thrive to increase efficiency of their subordinates by boosting their morale. This can be achieved when team leader can build strong relationships with their subordinates and encourage them to network with other employees as well. These formal and informal workplace networks also cultivate a healthy organizational culture. One study is particularly important for defining organizational culture and what leaders need to know about adopting specific leadership styles for promoting a productive culture. Warrick [14] demonstrated that strong organizational culture brings the best out of people and top management should align their organization strategies with their cultural ideal.

Employees also benefit from social networks for their professional development. They can enhance their learning, acquire new skills, and seek advice for career progression from experts within their organization. In this regard social networks provide a platform for employee development [26]. Extending employee development theory [35] has discussed the future of employee development by analyzing commonly used employee driven strategies along with modern techniques like social networking. Dachner et al., states that social networking provides employees with unique information sharing opportunities that fosters employee development via knowledge exchange.

An analytical summary of the intra organizational network genesis is mentioned in below table.

Table 1: Intra Organizational Network genesis

Intra-organizational networks	Network perspectives	Network genesis
Formal	Employees connected through formal work flows.	Exchange of information. Exchange of explicit and implicit knowledge.
Informal	Employees voluntarily connected through personal ties.	To understand the role and job responsibilities of peers. To cultivate a healthy organizational culture.
Embedded	Employees connected through formal and informal ties.	To build strong relationships with the subordinates. To increase employee satisfaction. Employee development. Career growth.

6. Types of workplace networks and their impact on individuals

The studies in this category demonstrate the real time employee networks which exists in organizations. Scott [2] states that employees at workplace develop multiple ties with their peers to discuss projects; share ideas; seek advice; seek support, and to reduce job stress etc. These relational ties in turn give rise to their specific networks. Existing social network theories suggest that these networks can have positive and negative effect on the individual's performance as well as the organizations productivity [36]. In the following section, the different types of employee social networks which exists in organizations have been highlighted.

6.1 Friendship Network:

One of the studies, [37] has examined friendship network in a private organization and they argue that friendship networks are created based on mutual trust, respect and emotional support. These friendships within organizations can have varying degree such as acquaintance, childhood friends, casual friends and close friends. Employees reach out to their friend's network for reducing stress and personal well-being. Many other scholars in the past have highlighted the benefits of having friends at workplace. Study done by [38], investigated the friendship prevalence and friendship opportunities, [39] studied the role of career concerns and workplace friendship, [6] examined the leader's multiplex centrality on team performance using friendship network and [4] studied workplace friendships in the context of innovative behavior, [40] demonstrated the interactive effects of personality and friendship networks on contextual performance, [11] explored the significance of having interdepartmental women friendships at workplace. Choi & Ko [41] has presented a theoretical model of workplace friendships. Literature also reveals that workplace friendships helps in promoting job embeddedness which increases employee efficiency at work [42] .

6.2 Advice Network

Several authors have examined advice networks of employees and they argue that advice networks are equally important for their professional development such as [43], [44], [45] and [46]. Cross, Borgatti, & Parker [31] investigate advice networks and found that employees seek advice from those individuals who are experts in their field, more experienced and are open to share their expertise. They demonstrated that employees at workplace form network ties for advice with those individuals whom they are confident will not turn down their request for acquiring knowledge or learning new skills.

Zaman et al., [47] explains that advice network is a two-way path in which advice giver and advice seeker both play a pivotal role for promoting organizational excellence. Advice networks are formed when employees are in an uncertain situation where formal documentation may not provide desired information, in this case individuals seek out and rely on their colleagues for advice and tacit information [48]. Advice networks are primarily informal in nature and this allows individuals to have the freedom to choose whom they seek advice from, Solitis et al., [27] explains this concept in detail by investigating the influence of advice network on employee's intention to quit.

6.3 Work And Collaboration Network

Other studies have focused on work and collaboration network such as collaborative ties within public organizations [49], director work networks [50], superimposed work network [51], searching influencers in work networks [52] and mutual trust in work network [53]. Work and collaboration networks are usually formal organizational networks which are critical for the normal functioning of the organizations to build shared values, trust, and provide mutual benefits to individuals and groups, driven by the skill set and expertise being brought on the table by both sides.

6.4 Knowledge Network

Few other studies focused on knowledge network of employees [5], [15], [54] and [16]. In one of the studies, [55] argue that knowledge networks are those organizational networks which are developed for sharing knowledge among different teams and individuals within organizations. Individuals seek other network members to develop, distribute and apply knowledge. These networks create value, empower communication and collaboration across the organization. They provide easy and quick access to relevant information. Knowledge networks exist between people, technology and process [56].

6.5 Avoidance Network

Only few authors have investigated this type of network due to the sensitive nature of the network data. Although this employee network exists in every organization which is termed as avoidance network, antipathy and aggression which highlights non-interaction in networks, particularly instances of intentional avoidance of interaction, however these networks tend to go unnoticed by many researchers.

Hoholm [28] states that employees may avoid interaction due to many factors such as fear of competition, to protect knowledge, enforce progress and maintain potential opportunities. He further elaborates that avoidance network can be formed as a result of a previous unsuccessful collaboration or unpleasant experience where lessons learnt linger long enough to create a pattern of avoidance. Kros, Jaspers, & Zalk [57] found that avoidance networks are usually less dense and less transitive, and are not reciprocated. Literature suggests that avoidance or hindrance network is often overlooked in formal workflows of the organization but they have a significant negative impact on the overall efficiency and productivity [30], [58] and [59].

7. Strength of ties

Few of the studies included in this review have discussed the strength of ties. These studies demonstrate that the mere existence of network ties is not sufficient rather the strength of ties is more important while analyzing organizational networks.

Authors have distinguished tie strength based on strong and weak ties. Strong ties exist between closely connected individuals such as employees of the same department, whereas weak ties are characterized by infrequent interactions among individuals who are socially distant such as employee interaction between different departments. The concept of strong and weak ties was introduced by [60], who argued that strong ties are essential part of the organization since they aid in fast information diffusion across all the team members but such ties have redundant information. On the contrary weak ties serve as a bridge between different teams who are otherwise not well connected and help in spreading valuable non-redundant information across all parts of the organization. Following the concept of strength of weak ties, Yang et al., [29] studied the network structure and socialization by exploring tie strength between alliance networks. They argued that strong ties helps produce dominant designs which promotes innovation. However, [61] supported the concept of weak ties to be beneficial for the organization by investigating knowledge spillovers for a semiconductor industry. In another study [62], the author opposes this notion by

hypothesizing that weak ties are not essentially the most non-redundant network ties and they may not be beneficial for the enterprises.

Another aspect of relational ties was explored by [63] and [64] who negated the theory of strong ties to be constraining and less beneficial for entrepreneurs and demonstrated that strong ties indeed provide the necessary information and support for mitigating the adversity and vulnerability for entrepreneurs, which lead to their success.

8. Positive and Negative ties

Some studies included in this review have also highlighted that not all network ties contribute equally towards achieving organizational goals. There are many invisible positive and negative network ties which exist in every organization. Positive ties arise from support, mutual trust, cooperation and friendship and form strongly connected network of individuals whereas negative ties stem from distrust, resistance, and conflict creating isolated networks. Most of the extant studies have focused primarily on positive ties and limited research exists for the negative ties.

Labianca & Brass [30] investigated the role of negative ties using social ledger theory and stated that negative ties have a stronger impact on organizational outcomes than positive ties. In another study [58], the author suggests that negative ties lack closure, and reciprocity and inhibits information transfer across individuals. Similar results were observed by [28], [59] and [57].

An analytical summary of network characteristics is mentioned below.

Table 2: Network characteristics of different organizational networks

Network Types	Network characteristics	Tie Strength	Network characteristics
Friendship	Mutual trust, respect and emotional support. Reduces job stress. Promotes individual well-being.	Strong ties	Exist between closely connected individuals. Creates more dense networks. Information diffusion of redundant information.
Advice	Promotes professional development. Organizational excellence. Tacit knowledge transfer.	Weak ties	Bridge between disconnected teams. Non-redundant information diffusion. Diverse information.
Work	Build shared values, trust and mutuality. Improves performance.	Positive ties	Support and mutual trust. Cooperation and friendship. Enhance team performance.
Knowledge	Promotes innovation. Knowledge propagation.	Negative ties	Inhibits information and knowledge transfer. Hinders healthy work environment.
Avoidance	Unsuccessful collaboration Fear of competition. Protects knowledge sharing.	-	-

9. Theoretical Inferences

The results from the previous studies emphasize that intra-organizational networks can be classified as formal, informal and embedded networks. The formal organizational networks are characterized by vertical workflows from top-down structure or horizontal workflows between co-workers. In both network settings, employees interact for exchange of information and resources. The formal networks are the legitimate route for mentoring, decision making and cross organizational approvals. The informal networks on the contrary, are the voluntary ties between co-workers who are not connected through any formal work flows. Individuals use these informal networks to get to know the work responsibilities of other teams which eliminates cross team conflicts. However, in an embedded network settings, both formal and informal network ties exist

between team members such as friendly relationship between a manager and his subordinates. Literature on organizational networks reveal that the main purpose of establishing such relationships is to develop synergy across team members.

In most of the organizational network studies content of social relations was most predominately studied. From individual perspective, two types of networks are most important; friendship and advice networks. These interlaced networks usually overlap in a work environment, yet there are intrinsic differences between the two. Friendship networks provide organizational embeddedness [65] and resource sharing [41], advice network on the contrary facilitate in professional knowledge transfer [54], and provides mentorship [9]. Together, these networks help the individuals to overcome job stress and reduce uncertainties at work.

From organizational perspective, work and knowledge networks are most significant. These networks provide a means for necessary collaboration across different teams and exchange valuable information. They create value and empowers cross organizational communication and help in dissemination of knowledge. Literature on organizational networks also highlights a conflicting network i.e., avoidance network which exists in every organization. This type of network is usually counterproductive which generates negative sentiments and repulsion among team members and creates isolates. These networks block knowledge transfer and hinder the normal organizational functions. For this reason, organizations should be aware of its avoidance networks so that they can be handled well in time and a healthy working environment can be promoted.

Results from the previous studies have investigated tie strength in terms of strong and weak ties. Strong ties exist between closely knit team members, whereas weak ties are found between distant team members. Strong ties inculcate a sense of belongingness with fast information diffusion, weak ties on the other hand act as a bridge between distant employees for new information diffusion which is more beneficial. Both these ties are instrumental in building the overall knowledge and data repository for the organization. Another set of ties discussed in literature is the existence of positive and negative ties. Positive ties enhance cooperation and open communication among the team members, creates dense networks and promotes a healthy organizational culture. Whereas negative ties are aversive and hostile which creates negative gossip at work. Negative ties are usually sparse but they have a detrimental effect on productivity and efficiency of the individuals as well as the organizations. Such networks should be eliminated as early as possible.

10. Conclusion and Discussion

The first objective of this systematic review was to identify the reasons why employees form specific social network ties in organizations. Out of the 48 studies selected for this review, only 9 studies were found that explore the reasons for emergence of intra-organizational networks of employees, suggesting that this realm is still in infancy stage and future research is required to investigate this aspect of social networks.

Another objective was to examine and identify different types of employee networks which exists in professional work environment and identify the important networks which are beneficial for achieving organizational goals. Out of the aforementioned friendship networks and advice networks are critical and imperative for the organization as they play a vital role in the creation of an overall healthy, collaborative and a synergized working environment. Studies available so far in this review have suggested it is critical for the organizations to be aware of the existence and penetration of these formal and informal networks. Although most of the studies analyzed in this review have primarily focused on the positive impact of employee social networks, however it is equally important to be aware of the negative employee interactions. The studies highlighting the strength of ties have suggested that within the context of strong and weak ties, both are necessary for the normal functioning of the enterprises.

In this review we tried to explore what are different types of intra organizational networks which exists in organizations and why they are created but our list is not fully comprehensive. Further, studies should incorporate other types of inter-organizational networks as well. Cross examining the effect of intra organizational on inter organizational network will be helpful in this regard. Another interesting approach can be to explore how these intra versus inter organizational networks effect the employee development within the companies. This will help to study these complex networks both at the micro and macro level. Research on employee development within the context of employee relationships will be beneficial for the individuals as well as the enterprises on the whole.

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