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ORIGINAL ARTICLE

An employee retention model using organizational network analysis for voluntary turnover

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Abstract
Contemporary research of employee social network analysis has grown far beyond the conventional wisdom of network and turnover theory; however, what is missing is a comprehensive review highlighting new perspectives and network constructs from a retention viewpoint. Since turnover is a concurrent component of retention, the analysis of the factors of quit propensity can result in a pre-emptive strategy for retention. This paper aims to capture the current state of the field and proposes a conceptual model for retention by exploring *network position, centrality measures, network type,* and the *snowball effect.* We identified 30 papers exploring voluntary turnover in social network constructs. Findings show that central network position is not always associated with negative turnover. Eigenvector, structural holes, and K-shell also prove to be a strong predictor of turnover. The snowball turnover of employees in similar network positions is pronounced in scenarios where employee sentiment is negative with poor group efficacy, entrepreneurship, and group values. This paper focuses on several themes to coalesce different determinants of an organizational network to demonstrate how social network theory has evolved to predict employee turnover. The resulting conceptual model suggests how to identify star performers and propose retention strategies.

Keywords Social network analysis · Employee turnover · Quit · Management strategies · Retention · Organizational network analysis

1 Introduction

In today's business environment, employees are considered to be the key intellectual asset (Albrecht et al. 2015); attracting and retaining them are crucial for knowledge-intensive industries (Deery and Jago 2015; Joo et al. 2015). However, voluntary exit of these employees takes a huge toll on the organizational success of a company. Since turnover is a concurrent component of retention (Holtom et al. 2008; Li et al. 2016; Mobley 1977), by analyzing the factors contributing toward quit propensity, a pre-emptive strategy to retain employees for a longer duration can be devised. Traditional approaches of human resource management (HRM) for turnover and retention have primarily focused on individual-level predictors such as job stress, unequal treatment, inadequate pay, or alternate job opportunities (Hom et al. 2017). However, there are other factors involved such as organizational networks (ON) or employee social networks which have a great impact on an employee's turnover decision. Literature suggests that the structural characteristics of these organizational networks such as network density, group cohesiveness, and network centrality are hypothesized to influence an employee's turnover intent (Gao et al. 2019; Ho et al. 2006). The main focus of this review paper revolves around how the structural attributes of the organizational networks have shaped an employee's turnover decision in the past and at present to demonstrate how the network theory has evolved, based on the identified network constructs formulate an employee retention conceptual model.

Network literature reveals that the contemporary research of organizational network analysis of employees has grown

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far beyond the conventional wisdom of network and turnover theory introducing new perspectives and new constructs (Ballinger et al. 2016; Gopalakrishnan et al. 2013). However, as the field is growing, the change has not yet been properly encompassed in any recent systematic review to reflect how network theory has progressed with respect to turnover. There is a need to organize what has been done and identify themes accordingly so that new theory can be built upon the old.

Upon investigating the past studies, most of the earlier network research states that the more social connections an employee has or more central they are in their professional network, more contented and more embedded they will feel in the organization, which leads to their reduced turnover (Feeley and Barnett 1997; Feeley et al. 2010). However, a thorough analysis of the literature suggests that it does not hold true in every situation; there are other factors involved such as social support, energetic activation, role of brokers, individual performance, etc. This "more is better" approach has been highlighted in many earlier systematic reviews; however, despite of the advancements in this field of study, no single review has gone far beyond the mantra "more is better." There is a gap in the literature. To address this issue, a comprehensive review is required to identify all the factors associated with network constructs and turnover in order to conceptualize a diagram for employee retention.

In recent empirical studies, the network position of employees is examined with completely new perspectives such as psychological contract breach (PCB) and energetic activation (Heffernan and Rochford 2017; Parker and Gerbasi 2016; Qu et al. 2019). New network measures such as *eigenvector centrality*, *k-shell scores,* and *structural holes* are introduced to predict employee turnover (Ballinger et al. 2016; Renneboog and Zhao 2019; Yuan et al. 2016), which challenge the traditional concepts of social network theory.

Historically, most social network research has focused on how the network structure and an individual's network position affects their turnover decision (Freeman 1979). However, an employee's turnover intent also depends on the type of network and the snowball effect of influential employees (Hayes et al. 2006; Gopalakrishnan et al. 2013). Previous studies have so far failed to coalesce different determinants of an organizational network for predicting voluntary turnover from a retention perspective.

There does not appear to be a systematic review that investigates the complete dynamics of organizational networks for employee turnover to enhance retention by considering the favorable and unfavorable work circumstances, nor is there a conceptual model that assists HRM in determining those at risk of resigning, with a view to mitigating these risks. By understanding the new viewpoints of social network parameters at a deeper level, human resource management (HRM) can mitigate voluntary turnover of employees and devise new strategies to enhance employee retention for adopting a better knowledge management (KM) system.

The aim of this paper is to integrate all the latest developments of relational determinants of turnover which have been overlooked in the past and present a comprehensive review highlighting the new perspectives and the network constructs being investigated by the modern researchers as opposed to the conventional wisdom of network and turnover theory and propose a new retention model.

In order to achieve this, a systematic literature review has been undertaken examining four essential network components: *network position, centrality measures, types of network,* and *snowball effect* of turnover. This approach follows Jo and Ellingson's (2019) multidisciplinary methodology of relational turnover who categorized their research on

(i) behavioral, (ii) structural, and (iii) the psychological feature of social relationships. Building on Jo & Ellingson's relational perspective, this review incorporates the structural characteristics by investigating *network position* and *centrality measures,* behavioral characteristics by exploring *types of network* and psychological features by examining the *snowball effect* of employee voluntary turnover. This paper focuses on several themes to coalesce different parameters of an organizational network to demonstrate how social network theory has evolved to predict employee turnover and based on the findings propose a new employee retention model. In this model, we analyze the relationship between four different network parameters and turnover to assess the impact of new network constructs and to clarify the mechanism through which the new network perspectives (favorable and unfavorable scenarios) and network position are associated with employee's intention to quit. Furthermore, in our conceptual model we identify the star performers of the organizations and suggest their retention strategies (Fig. 2). The main objectives of this review are:

(RO1) To document recent developments in the complex heterogeneous social networks and turnover studies.

(RO2) To determine how favorable and unfavorable work circumstances influence different structural positions and network measures which contribute toward predicting employee turnover.

(RO3) To examine the existing organizational networks and the snowball effect of employee turnover on their peers.

(RO4) To illustrate how HRM can make use of these social network parameters to mitigate voluntary turnover and enhance retention by presenting a conceptual model emanating from the gap in literature.

Based on the research objectives of this study, this systematic review will help answer these research questions:

RQ1: What new themes around social network in turnover studies are being examined by contemporary researchers in terms of structural position and network centrality?

RQ2: What new constructs are being investigated?

RQ3: What are the dynamics of contemporary network theory versus the conventional wisdom of network studies?

RQ4: What are the gaps in the previous research and how they can be addressed in the future?

RQ5: Does a systematic review of social network turnover studies lead to conceptual model that inform management decision-making for enhancing employee retention?

The next section discusses the research method. Results of the study are presented in Sect. 3. The application of SNA on turnover is explained in Sect. 4 based on different trends identified. This is followed by a detailed comparative analysis. The conceptual model is presented in Sect. 5. The overall discussion, conclusion, and future work are discussed in Sects. 6 and 7.

2 Research method

We adopted Kitchenham's (2004) review protocol for conducting this study by first planning, organizing and then reporting the results. Using this procedure, we identified the need for carrying out this review, followed by the review protocol and presenting the results and analysis of the study. Arising from the analysis, we have developed a new conceptual model for employee retention, which synthesizes the findings of this study.

2.1 Review protocol

For extracting and analyzing the most relevant research papers for our study, a review protocol was developed, which defined the focus for the literature search and systematic review inclusion criteria. This section discusses the review protocol in detail.

2.1.1 Focus of our review

Our review of the application of social network analysis (SNA) for employee turnover was influenced by the importance of retaining high-quality employees for organizations (Deery and Jago 2015; Joo et al. 2015). Since turnover is a concurrent component of retention, employee retention will only be possible if organizations know the reasons why employees leave in the first place. In this regard, SNA has emerged as an important analytical tool to examine the employee interdependencies based on structural configuration of networks (Burt 2000; Kwon 2017; Yuan 2019), to extract useful meaning and forecast various outcomes such as turnover and thereby enhance retention. This review contributes toward the voluntary turnover and retention theory by exploring various determinants used in SNA.

2.1.2 Literature search

Multiple databases were searched to identify research articles and conference papers which fulfill our review criteria such as: Science Direct, IEEE Xplore, PsycINFO, Business Source, ProQuest, Scopus, and Institute for Scientific Information's Web of Science. Many past studies have focused on employee turnover and SNA; however, for the present study only papers from the past 20 years, state-of-the-art and major contributions in this field have been discussed. We used a Boolean search strategy to explore the database using the following keywords:

(1) (Employee voluntary turnover OR turnover intent OR quit OR resign OR leave OR exit) AND
(2) (Social network analysis OR organizational network analysis OR social relationships OR social network OR workplace networks OR network analysis OR employee network OR employee relations OR network ties OR employee social networks)

Duplicate articles were identified and deleted at each iteration of the database search, and they were removed again during full-text review. We also removed any such article which was clearly unrelated to 'SNA and employee voluntary turnover.' The abstracts and body of the articles were also examined to identify whether social networks were used as a construct.

Further manual review was conducted to explore the bibliographies and the references. The reference sections of the selected studies were parsed to identify more relevant studies on SNA and turnover. To further refine the scope of the review, systematic reviews on turnover and SNA published in the past were examined to extract as many relevant articles from the reference section as possible for a thorough analysis.

2.1.3 Systematic review criteria

A research paper was eligible for this systematic review if it fulfilled the following inclusion criteria:

- Social network analysis tools and techniques were used
- Voluntary turnover or turnover intention was analyzed
- Employee turnover was discussed specifically
- The study was published in the English language
- Full text was available
- Literature was published in last 20 years (January 1999–December 2020)

This time period was chosen because this was when the application of SNA started gaining popularity in industry.

Any research paper was excluded if:

- SNA was used as a reference term, but a social network analysis was not conducted
- The principal focus of study was turnover, but SNA techniques were not applied
- Social network measures and strategies were not clearly mentioned
- The study included customer turnover instead of employee turnover
- The study included involuntary turnover by the employer or forced resignations
- The research paper itself was a review

The selected research papers were further scrutinized as follows:

- Titles and abstracts were individually reviewed
- The full manuscript was read to review the results

2.1.4 Study selection

The database keyword search returned a total number of 11,744 research articles. Articles not related to voluntary turnover were eliminated. Only peer-reviewed articles were considered which reduced the research results to 2300. A close study of the titles and abstracts of the identified research papers revealed 89 studies matching the review criteria, which were subject to a full text review. Following the inclusion protocol, 30 studies were considered for this comprehensive review. The identified research papers were then further scrutinized (Fig. 1).

3 Results

Our qualitative synthesis of the literature resulted in 30 articles representing a diverse application of SNA on voluntary turnover. The most common topics discussed in past papers varied from CEO turnover, network contagion, intended, actual turnover, etc. Most of the papers ($n = 19$) were published from 2013 to 2019; remaining papers were published

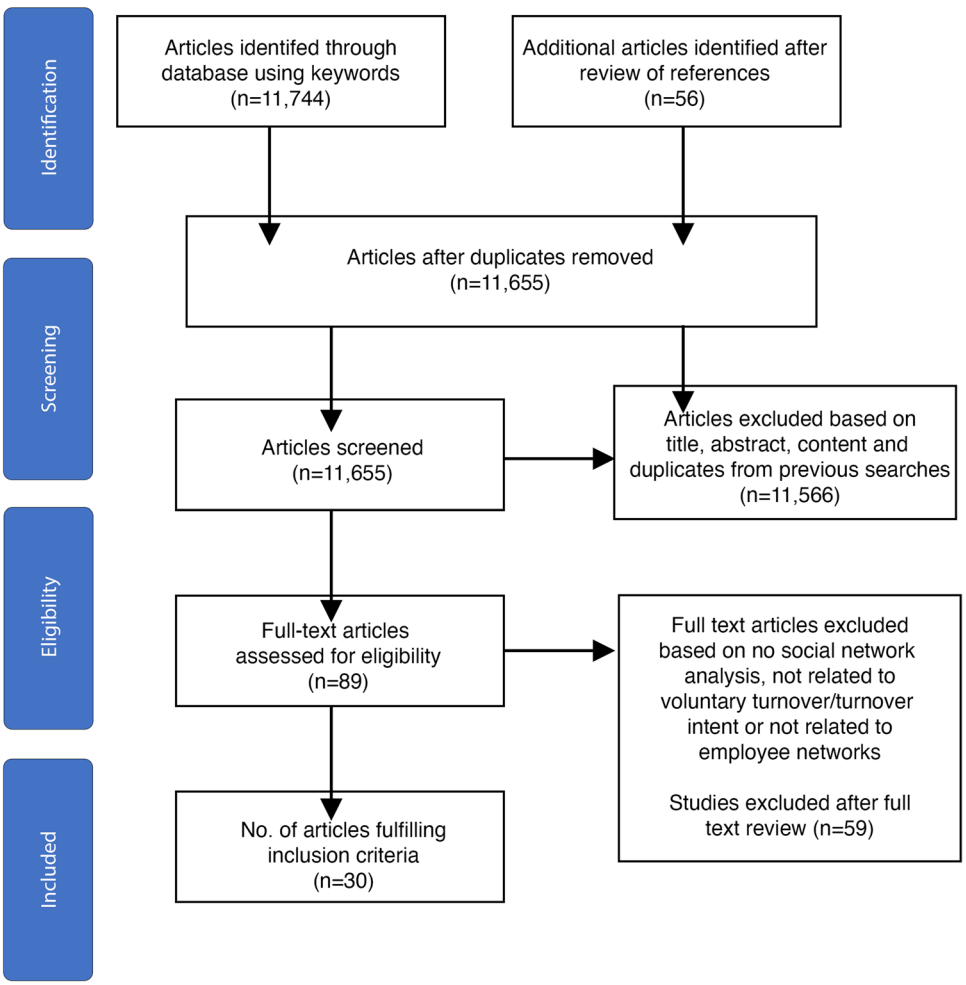

Fig. 1 Study selection protocol

in earlier years (1 in 2000–2003, 5 in 2004–2007 and 5 in 2008–2012). Detailed results of this study are presented in Table 1 based on different categories.

Most of the research papers were based in USA ($n=15$). China was the second most dominant focus of study ($n=5$). Few of the articles conducted their research in global firms of different regions. The remaining studies examined social networks and voluntary turnover in other countries such as (1 in Pakistan, 1 in Ireland, 1 in Netherland, 1 in Korea, and 1 in England).

4 Application of SNA for employee turnover

Four trends were observed when organizing the studies which were selected for this review, namely *network position, centrality measures, types of networks,* and *snowball effect* of turnover. These trends are the building blocks for carrying out an organizational network analysis (Scott 2000). Literature suggests that any network study essentially constitutes these network parameters, without which SNA cannot be executed. Categorizing these parameters as an individual trend helped to analyze how these individual constructs have evolved over time from conventional to contemporary research and investigate how each of these parameters influence employee turnover.

4.1 Trend one—network position

Network position is one of the fundamental concepts of SNA which provides many opportunities and constraints for the employees (Freeman 1979; Scott 2000). The structural network position of the employees is important as it can inform an individual's decisions taken at work, such as his decision to resign or turnover intent.

The most widely investigated network positions are *central*, *peripheral* and *knowledge brokers*. These network positions are not dependent on the hierarchical status of the employees, rather employees at any hierarchy can benefit from their strategic positions (Burt 2005). Conventionally, centrally located employees are hypothesized to have quick access to peer support and other valuable resources, as a result they feel more contented, perform better, and are less likely to leave, whereas employees on the periphery have limited access to information, feel less connected toward the organization and the probability of quitting increases. Feeley (2000), Kwon (2017) and Yuan (2019), supported this argument by investigating peripheral and marginal employees in the context of the solidarity and instrumental ties. Their model suggested that employees in peripheral network positions and marginal identity are more likely to quit, whereas central employees have lower probability of turnover. These findings are also consistent with Mossholder et al. (2005).

However, recent research reveals that being in a central network position is not sufficient for a reduced turnover; there are many other factors involved, such as social support, energetic activation, performance, etc. While examining CEO turnover in the labor market, Liu (2014) found that a highly central CEO with many network ties who is a poor performer will further expand his social connectedness for exploring outside job options and will have a higher turnover probability as compared to a less central CEO. Feeley et al. (2010) hypothesized that social support plays a moderating role between network position and turnover; employees more central in the network have a better coping mechanism for job stress when they have social support from their peers. Vardaman et al. (2015) explored another aspect of network centrality and turnover by discussing the possibility of translating an employee's intention to leave into an actual turnover suggesting that when an employee is contemplating turnover, his decision is attenuated by network centrality.

Another interesting study on energetic activation and turnover from a relational perspective was undertaken by Parker and Gerbasi (2016). Energetic activation is derived from human energy which leads to enthusiasm at work (Cross et al 2003; Quinn et al. 2012; Owens et al. 2016). Parker and Gerbasi (2016) argued that an employee central in his network is less likely to be dismissed from his position when his coworkers perceive him to be energizing.

Similar to the social network concept of the West, "guanxi," a term coined for social interaction of employees in China is also gaining popularity (Law et al. 2000; Leung and Wong 2001; Wong et al. 2001). 'Guanxi' is more deeply embedded in Chinese culture as compared to the Western concept of social networks (Bian 1994). By investigating the network positions in guanxi networks, Hom and Xiao (2011) demonstrated that dense social networks devoid of structural holes or brokers reduce the employee turnover rate, which supports Burt's (1992) theory of structural holes and also consistent with findings of (Feeley and Barnett 1997; Shaw et al. 2005).

A thorough analysis of literature also revealed that network positions can also determine the influence of the specific nodes on rest of the network. Ranking the core nodes of the network based on their influence is also gaining popularity. Central nodes tend to be more influential than the peripheral nodes (Yuan 2019). The turnover decision of influential nodes stimulates others in the network to do the same.

Historically, network position is most frequently investigated as having a direct association with turnover; however, recent literature shows that network position sometimes serves as a moderating variable as well. Based on the classic theory of network position (Brass and Burkhardt 1993; Burt 1992; Powell et al. 1996), a new aspect of psychological contract breach (PCB) based on higher network position and turnover was examined by Heffernan and Rochford

Table 1 Study description, sample, methodology, and network characteristics from applied SNA on turnover in the review ($N=30$)

Author(s)/year	Population/sample	SNA topic	Theories	Method/study design	Network type & measure	SNA effect on turnover
Ballinger et al. (2010)	USA Study 1:330 employees Study 2: 496 employees	Leader–member exchange and turnover	None	Network data cross-sectional Quantitative	Whole network *Work ties* *Centrality*	Increases
Ballinger et al. (2016)	Global 484 participants	Network structure to predict turnover	Social capital	Network data cross-sectional Quantitative Name generator	Whole network *Work-network* *In-Degree* *Incoming* *Eigenvector* *Structural hole*	Decreases
Feeley (2000)	USA 70 employees from 3 different organizations	Network embeddedness	Erosion model Network integration Centrality	Network data cross-sectional Quantitative Checklist	Whole network *Work-network* *Degree* *Betweenness Closeness*	Decreases
Feeley et al. (2008)	USA 40 participants	Predicting turnover in friendship network	None	Network data cross-sectional Quantitative Questionnaire	Whole network *Friendship* *In-degree* *Out-degree*	Decreases
Feeley et al. (2010)	USA Sample size ranged from 40 to 1203 participants	Erosion Model	Strength of ties	Network data longitudinal Quantitative	Whole network *Communication network* Social Support Network centrality	Decreases
Gao et al. (2019)	China 2000 participants	Weighted network	Forecasting theory	Other (neural network) Survey	Partial network	Increases
Gloor et al. (2017)	Global organization 866 participants	E-mail based social network	None	Network data longitudinal Quantitative	*Closeness Degree Betweenness*	Increases
Gopalakrishnan et al. (2013)	Global technology firm 728 employees	Role Similarity in Project Affiliation Networks	None	Network data longitudinal Quantitative	Whole network *Degree centrality*	Increases
Haq et al. (2017)	Pakistan 100 participants	Negative ties	None	Cross-sectional Quantitative Questionnaire	Whole network *Interpersonal dislikes Conflicting ties*	Increases
Heffernan and Rochford (2017)	Ireland 242 participants	Psychological contract breach	None	Cross-sectional Quantitative Questionnaire	Whole network *Work network* *Tie connectedness*	Decreases
Ho et al. (2006)	USA 55 participants	Social networks and psychological contract	Network cohesion Structural holes	Quantitative In-depth interviews Survey Roster recall	Whole network *Advice/Friendship network* *Psychological contract* *Network centrality*	Increases
Hom and Xiao (2011)	China 417 participants	Guanxi networks	Strength of ties Cross system ties	Name generator Network closure index	Ego-network *Friendship* *Colleague* *Structural holes* *Brokers*	Decreases

Table 1 (continued)

Author(s)/year	Population/sample	SNA topic	Theories	Method/study design	Network type & measure	SNA effect on turnover
Kwon (2017)	Korea 240 participants in research-type public agency	Social embeddedness	Social identity theory	Sequential mixed methods "who-to-whom"	Whole network *Solidarity* *Instrumental* *Degree*	Increases
Kitts and Trowbridge (2007)	USA 598 participants	Interplay of structured social influence	Cohort influence Strength of ties	Quantitative	Whole network *Recruit and Founder*	Increases
Liu (2014)	North America 19 annual networks of 7586 CEOs extracted from BoardEx	CEO turnover	Network Connectedness	Network data longitudinal Quantitative	Online network *Director-Corporate Networks* *Degree* *Betweenness Closeness* *Eigenvector*	Increases
Maertz and Griffeth (2004)	USA	Motivational Forces	None	Qualitative	Whole network *Network centrality*	Decreases
Mossholder et al. (2005)	USA 215 health care employees	Structural, attitudinal, and behavioral predictors	Social Capital Social Exchange theory	Network data longitudinal Quantitative Survival analysis	Whole network Communication/*Advice* *Co-worker support* *Network centrality*	Decreases
Moynihan and Pandey (2008)	USA 326 participants	Ties that Bind	None	Cross sectional Quantitative	Partial network Centrality	Increases Decreases
Parker and Gerbasi (2016)	Global IT (USA, Asia Pacific, Europe) 191 participants	Energetic activation	Job embeddedness theory	Network data longitudinal Quantitative	*Work network* *Energetic activation*	Decreases
Qu et al. (2019)	USA 6153 participants	Outside director turnover	None	Network data longitudinal Quantitative	Whole network *Network centrality*	Increases
Renneboog and Zhao (2019)	London 2500 participants	Director turnover	Strength of weak ties	Longitudinal Quantitative	Whole network *Director* *Degree* *Closeness* *Betweenness*	Increases
Shaw et al. (2005)	Global restaurant chain 2,198 participants	Turnover	Social Capital Theory	Cross-sectional Quantitative	*Network density* *Structural hole bridge* *Betweenness*	Decrease
Soltis et al. (2013)	USA 229 participants	Distributive justice and social network	Job -embeddedness	Cross-sectional Quantitative Roster-recall Who contacts whom	Whole network *Work/advice* *degree centrality, in-degree and out-degree*	Increases
Troster et al. (2018)	Netherland 121 employees	Coevolution of Social Networks and Quitting	Conservation of Resources theory	Network data longitudinal Quantitative	Whole network *Friendship /Advice*	Retaining friendship ties- Dropping advice ties

Table 1 (continued)

Author(s)/year	Population/sample	SNA topic	Theories	Method/study design	Network type & measure	SNA effect on turnover
Vardaman et al. (2015)	USA Study 1: 145 participants Study 2: 183 nurses	Intended and actual turnover	Temporal construal theory	Network data longitudinal Quantitative Online survey	Whole network *Friendship/Advice* *In-degree* *Out-degree* *Dyadic* *Triadic*	Decreases
Vardaman et al. (2018)	USA 103 participants	Organizational Identification and turnover	Social identity theory	Network data longitudinal Quantitative Roster recall	Whole network *Simmelian ties* *Non-simmelian*	Decreases
Wang et al. (2016)	USA 389 employees	Social Network Contagion	None	Cross-sectional Quantitative Sociometric questionnaire	Whole network *Advice ties*	Increases
Wang et al. (2017)	China 25 collective events	Casual network mapping of collective turnover	None	Network data longitudinal Quantitative Roster recall	Whole network *Degree* *Betweenness*	Increases
Yuan et al. (2016)	China 104 participants	Promotion and resignation	None	Network data cross-sectional Quantitative	Whole network *Action network* *Online social network* *K-shell* *In-Degree* *Out-Degree*	Decreases
Yuan (2019)	China 124 participants from market-listed company	Intention to quit	None	Network data cross-sectional Quantitative Network density	Multiplex network *Action/Friendship* *In-Degree* *Out-Degree* *Degree* *K-shell*	Increases

(2017). Investigating the social networks of officers in the Irish Defense force, the researchers found that network position also serves as a moderating factor between a PCB and turnover, these results conform with the work done by Ho et al., (2006) and Burt (2000).

Contrary to the general belief in literature regarding central employees having the lowest turnover intent, recent studies show that this theory may not hold true for every situation. In scenarios when a company's stock is expected to crash, the most central directors of the organization tend to protect their reputation rather than supporting their organization in difficult times and resign before the company stock crashes. The informational advantage is exploited in case of restatements and lawsuits to protect their own prestige (Qu et al. 2019).

Overall, the literature review yielded contradictory results with regard to network position and turnover. On the one hand, a central network position greatly reduces an employee's probability of turnover; on the other hand, it also promotes employee turnover intent when circumstances are not favorable either for the employee or for the employer. Gao et al. (2019) argue that exploring the relational aspect of employee's network centrality is inevitable for analyzing the determinants of voluntary turnover.

An analytical summary of trend one is outlined in Table 2.

4.2 Trend two—centrality measures

Social network analysis relies on different centrality measures in order to understand organizational network characteristics (Bonacich 1972; Seidman 1983 and Freeman 1979). Although every SNA study employs different centrality measures for analyzing organizational networks which may seem to be a repetitive pattern, this study investigates which centrality measures are most frequently used in turnover studies and how employee turnover can be predicted. The SNA measures identify the most critical nodes of the network by highlighting a unique aspect of network nodes such as *degree centrality, closeness* and *betweenness*. Despite each of these centralities measuring a different interaction pattern of an individual, these measures indicate a unique prominence of an individual in the network (Wasserman and Faust 1994). The studies which have used these centrality measures to predict voluntary turnover are discussed below.

In the majority of network studies (e.g., Cross et al. 2002 and Soltis et al. 2013), *degree centrality*, *in-degree,* and *out-degree* have been most widely investigated from a turnover perspective. Results of earlier research reveal that a higher degree centrality was a negative predictor of turnover. Mossholder et al. (2005) hypothesized that employees with a higher in-degree are more attached to their organization, reducing the likelihood of turnover, confirming the previous findings of Feeley (2000) and Burt (2001). However, findings of Liu (2014) negate this argument, hypothesizing that a higher degree centrality provides the employees with ease of access to outside job information which leads to a higher turnover.

Apart from degree centrality, there are other SNA measures which are used in current network studies of turnover such as K-shell scores. K-shell is a centrality measure which is used for identifying the core and peripheral individuals of the network (Seidman 1983). It is increasingly argued that the K-shell scores prove to be a strong predictor of turnover as compared to degree, closeness and betweenness. Adopting this network construct, Yuan et al. (2016) measured the actual action network and online social network of employees using in-degree and K-shell scores. The findings proved that employees with higher in-degree value in action networks have a higher promotion probability and they are less likely to leave, while employees with low K-shell value in action and online social networks have a higher probability to resign.

Earlier network studies have highlighted the impact of network centralities on turnover (Maertz and Griffeth 2004; Feeley et al. 2008; Soltis et al. 2013). Ballinger et al. (2016) employed a different approach to network centrality. They investigated voluntary turnover by utilizing *social capital*, *eigenvector centrality*, *in-degree centrality* and *structural*

Table 2 Analytical summary of turnover based on network position

Network position	Employee turnover intention
Centraly positioned (Favourable circumstances)	1. More contented, perform better and they are less likely to quit 2. Reduced turnover when they have higher energectic activation 3. Reduced turnover if they are also influential nodes
Centraly positioned (Un-favourable circumstances)	1. Higher turnover intent in case of poor performer 2. Turnover intent is moderated by social support 3. Higher turnover when company's stock is expected to crash 4. Higher turnover when already seeking for new job options
Periphery of the network	Limited access to information, less connected and their probability to quit is higher
Brokers	Control information flow between disconnected groups, feel more empowered and their intention to quit is reduced

holes. Their findings indicate that incoming eigenvector centrality has a negative relationship with intention to quit, and job hierarchy moderates the negative relationship between structural hole and turnover. Adler and Kwon (2002) also supports this argument.

Prior research addresses closeness network centrality to be negatively associated with turnover (Wasserman and Faust 1994). The higher the closeness centrality, the more strongly the employee is embedded within the organization. However, as opposed to this argument, the recent research shows that a higher closeness centrality may result in a higher employee turnover in four situations: (i) strong ties outside the organization; (ii) an upcoming lawsuit against the organization; (iii) employees already seeking new job opportunities; and (iv) employees shifting their task responsibilities to their peers.

Renneboog and Zhao (2019) investigated director turnover in the labor market by measuring the closeness centralities of directors. They demonstrated that directors with higher closeness centrality have a higher probability of turnover which is consistent with the existing literature on the 'strength of weak ties' (Granovetter 1973) and brokers' theory (Burt 2005). Similar results were found by (Qu et al. 2019); however, their argument was based on the fact that increased turnover was subject to having fear of the potential company crashes in near future. Gloor et al. (2017) investigated the communication patterns of managers based on e-mail exchange. E-mail is a good data source for exploring different relational aspects of employees at their workplace (George et al. 2014; Sharaff and Nagwani 2015; Wen et al. 2019). The author analyzed the closeness centrality pattern of managers who resigned and found that five months prior to resignation, managers suddenly increased the frequency of communication with others at work in terms of a higher centrality in closeness, degree, and betweenness oscillation, which suggests managers attempting to allocate their tasks to others.

Up until now, betweenness was also considered to be negatively related to turnover. However, employees who are not efficient and are not highly productive tend to have a higher turnover probability. Liu (2014) supports this argument by demonstrating that a poor performing CEO despite having a higher betweenness network measure will eventually resign.

An analytical summary of trend two is mentioned in Table 3.

4.3 Trend three—types of networks

There are many different types of networks which exist in organizations such as advice-seeking; advice-giving; friendship; work-related; and avoidance networks. These networks are quite complex and reflect varying interdependency of employees on each other (Mossholder et al. 2005; Parker and Gerbasi 2016; Scott 2000).

Kitts and Trowbridge (2007) examined the turnover of recruit and founder colleague networks. They argued that tie strength or cohesiveness of colleague networks in the current workplace increases with the voluntary turnover of

Table 3 Analytical summary of turnover based on network centrality

Centrality measures	Employee turnover intention
Higher in-degree centrality	1. Greater number of incoming ties, more popular and less likely to quit 2. Higher tunover intent when: (a) access to outside job information (b) already exploring new job opportunities (c) attempting to allocate their tasks to others
Lower in-degree centrality	Few incoming ties, feel less valued and their probability to quit is higher
Higher Eigenvector centrality	More influencial, feel more empowered and have a negative relationship with intention to quit
Lower Eigenvector centrality	Less empowered, less motivated and have higher turnover propensity
Higher Closeness centrality (within organization)	1. Feel more committed and less likely to resign 2. Higher tunover intent when: (a) already exploring new job opportunities (b) attempting to allocate their tasks to others (c) upcoming lawsuit against the organization (d) strong ties outside organization
Lower Closeness centrality (within organization)	Less motivated and more likey to quit
Higher Betweenness	1. More empowered, reduced intent to turnover 2. Higher turover intent when: a) employees are poor performers (b) already exploring new job opportunities (c) attempting to allocate their tasks to others
Lower Betweenness	Less empowered, less motivated and have higher turnover propensity

employees, extending Harrison and Carroll's (2002) model of employee cohesiveness in organizational networks. Moynihan and Pandey (2008) examined how intra-organizational networks shape an individual's decision to leave. They hypothesized that employees who form strong intra-organizational ties and Person–organization fit (P–O) tend to stay longer in the organization and employees having strong ties outside the organization tend to leave early. Their findings were consistent with Elfenbein and O'Reilly's (2007) research.

Similar results were obtained by Feeley et al. (2008), who studied turnover in a friendship network in a fast-food restaurant. In-degree and out-degree centrality scores were measured by using UCINET [VI] software as stated in Borgatti et al. (2002). Data analysis revealed that turnover variance was strongly correlated with friendship networks.

Maertz and Griffeth (2004) conducted important social network research on an advice network and an employee's intention to quit. They hypothesized that distributive justice, defined as perceived fairness of reward among employees, plays a mediating role between advice-giving ties and intention to quit. Employees who are frequently approached for advice by their colleagues feel they are burdened and their intention to quit increases if their efforts are not recognized and rewarded accordingly (see Table 4).

Extending the work done by Feeley et al. (2008) on friendship networks and turnover, Vardaman et al. (2018) examined the simmelian ties of organizational identification in a family-owned firm. The findings suggested that non-family employees' turnover rate is reduced when they have higher centrality in the friendship network of family employees as compared to non-family employees. This argument of organizational identification is also supported in other research (Ashforth and Schinoff 2016; Mitchell et al. 2001).

Another aspect of relational ties in the workplace was explored by Haq et al. (2017) who examined interpersonal dislikes and conflicting ties. They found that dislike among colleagues at a workplace is positively related to turnover intention while conflicting ties do not have a significant impact on turnover intention. Since workplace social networks are not only limited to professional, advice and friendship relations, they are multifaceted, comprising of positive and negative ties (Everett and Borgatti 2014; Labianca 2014). Positive ties arise from mutual trust, friendliness and feeling of belongingness, whereas dislike, avoidance, and conflict give rise to negative ties (Labianca and Brass 2006; Haq et al. 2017).

From a network theory perspective, turnover was considered a consequence of network structure until now (Feeley and Barnett 1997; Wasserman and Faust 1994). Contrary to this approach, Troster et al. (2018) proposed a model which illustrates that an employee's thoughts of quitting changes network ties. They theorized that friendship and advice networks are continuously being shaped by thoughts of quitting. Results suggested that employees who have a higher intention to quit have a tendency to drop old ties and create new ones in advice networks, but their friendship ties remain the same. A number of other studies (Brass et al. 2004; Parker and Gerbasi 2016) have found similar results regarding changing network ties with time.

An analytical summary of trend three is mentioned in Table 4.

4.4 Trend four—snowball effect of network position

When an influential employee leaves an organization, the decision may have a reciprocal effect on his colleagues. Krackhardt and Porter (1986) state that turnover in a workplace is not a random phenomenon; it occurs in groups. In an empirical research, Hayes et al. (2006) argued that probability of cluster leaving among the top hierarchy increased many fold when the CEO resigns. Ballinger et al. (2010) also demonstrated that when a team leader who has strong

Table 4 Analytical summary of turnover based on workplace networks

Types of networks	Employee turnover intention
Strong Intra-organizational network	More connections at workplace, more committed, more embedded in the system and less likely to leave
Colleague networks	Person organization (P–O) value fit reduces turnover
	Tie strength and cohesiveness increases with higher turnover
Friendship network	Greater number of friends at workplace, better coping mechanism for job stress and lesser quit propensity
	Lower tunover of non-family employees when they have centrality in family employee network
	Thoughts of quitting changes network ties
Advice-giving network	Frequently approached for advice, feel over burdended and more likely to resign
	Turnover intent is mediated by distributive justice
	Thoughts of quitting changes network ties
Dislikeness network	Feel uncomfortable and have higher turnover intention
Conflicting network	These ties have no significant influence on turnover

cordial relations with his team members quits, his peers and subordinates are more likely to leave. Their decision stems from fear of not having similar friendly ties with the successor team lead.

Meta-analysis of one of the studies revealed that employees with similar designations also have a significant impact on turnover, creating a snowball effect (Lorrain and White 1971). Results from a quadratic assignment procedure (QAP) test performed on a dataset acquired from three different fast-food restaurants were significant, with $P < 0.004$. Findings suggested that employees who are perceived to be in equivalent roles at workplace tend to stay together or quit in clusters (see Table 5). Literature suggests that embeddedness and closeness of social networks play a key role in cluster leaving (Felps et al. 2009; Mossholder et al. 2005). When many employees in a common project occupying similar job hierarchy resign, it creates a ripple effect and the probability of turnover for the rest of the team is also higher.

Feeley and Barnett (1997) refined the snowball effect analysis in cluster leaving by stating that employees with strong communication ties to those who resigned increased their likelihood of quitting irrespective of their job hierarchy. Similar results were observed by Gopalakrishnan et al. (2013) who examined turnover in project affiliated groups in a technology-based firm. They found that individuals whose network included more people who had left the organization were also more likely to quit. Similar results were observed by Wang et al. (2016) who studied contagion turnover.

Apart from turnover of influential employees and equivalent job roles, there are other factors involved for cluster leaving. Wang et al. (2017) extended the concept of collective turnover in organizations based on casual network mapping and found that negative sentiments, cognitive contagion, group efficacy, an enthusiasm for entrepreneurship and similar group values stimulate translocated mutual turnovers in organizations (see Table 5). Few other studies have also highlighted entrepreneurship, cognitive sense-making, and group efficacy as triggers for collective turnovers (Biraglia and Kadile 2016; Li et al. 2010; Zomeren et al. 2004).

An analytical summary of trend four is mentioned in Table 5.

4.5 Measurement opportunities

Most network studies on turnover have adopted a cross-sectional approach for data collection. While this methodology may be quick and easy to conduct, it fails to capture the continuous evolving nature of social relationships, which is a major drawback. Social networks are rarely static and keep on evolving with time, based on employees' specific circumstances (Zhao et al. 2018). Future research could incorporate a cross-sectional approach along with longitudinal studies for a better validity of results, building a more viable framework for predicting turnover based on social network parameters.

Our findings indicate that most studies used a whole network approach to investigate the network position of employees. This method gives the overall picture of organizational networks, but it has its limitations. To capture whole network data, all individuals must be included in the survey—which is difficult. Whole network data do not explain the opportunities and constraints of individual employees. To get a closer look of organizational data structure, future research can study the whole network first and then extract ego networks from it (Hanneman and Riddle 2005). This method is ideal for observing the whole network along with multiple ego networks for analyzing individual behavioral patterns.

Other centrality measures such as *power*, *PageRank*, *Katz centrality*, *cross-clique centrality,* and *reach* are not frequently used in turnover research. These new network constructs can measure the most prominent nodes by categorizing specific employee characteristics such as high potential employees, mentors, entrepreneurs, etc. by assigning relative scores and thus give a more comprehensive picture of the network. Future research is needed to answer research questions such as: what is the turnover intent of the most prominent nodes (based on the SNA measure and specific

Table 5 Analytical summary of snowball effect on turnover

Snow ball effect	Employee turnover intention
Equivalent job roles	Tend to stay together or quit in clusters
Common projects with similar hierarchy Cordial relationship with subordinates	Share similar values and similar experiences, when few of them leave it creates a rippling effect on others Triggers turnover intent of peers and subordinates when team lead resigns
Enthusiasm for entrepreneurship in a team	Motivate others to leave their job and persue their dreams
Group efficacy	Stimulates mutual turnovers
Negative sentiments for employer CEO with amicable personality resigns Strong relationship with employees who resigned	Provokes group turnover Subordinates resign Increases quit propensity of others

employee characteristics) of the network? Or what will be the impact of turnover of these prominent nodes on the rest of the nodes? To understand how prominent nodes stimulate turnover, we need to consider all the above network measures side by side. Since these SNA measures indicate the importance of an individual in their own unique way, by incorporating these measures together, turnover research can be broadened to a greater extent.

Examining past research on network studies, two methodological findings become evident. Firstly, most of the studies adopt a questionnaire approach for analyzing networks. Survey/questionnaire methods have their pros and cons, individuals may give politically correct replies, many questions go unanswered, capture unconscientious responses, and so on. A more robust approach is to study actual networks. Analyzing multiple communication platforms such as e-mail exchange, call detail records, digital recordings of virtual meetings will give more accurate network insights. Secondly, much of the research has focused on turnover *intent* rather than *actual* turnover. Turnover intent may not always translate into the actual turnover of individuals. For reliability, we encourage future studies to correlate results of turnover intent with actual turnover.

Individuals who are prominent because of their influence and talent are the most significant in any social network. Such employees are usually the key players who drive performance in organizations. In the majority of past studies, the snowball effect is measured in terms of employees in general. Categorizing and predicting turnover of these employees based on their intellect, or influence (e.g., influencers and high potential employees) measured in terms of centrality and then analyzing the impact on cluster leaving would be more beneficial. This method of coalescing employee characteristics with network measures will further refine turnover theory. The results of such an analysis can be used not only to identify the key players for any organization but also highlight the influence of their decision on the entire network.

5 Way forward—conceptual model

A thorough investigation of previous studies reveals that a retention model has never been discussed within social network context. Based on our review on SNA and employee turnover studies and the gaps identified, we suggest a conceptual model of employee retention which comprises of the following elements as depicted in Fig. 2. The retention model is developed by integrating the shortcoming of all the four trends investigated in this review, namely *network position, centrality measures, network type,* and the *snowball effect.* In addition to this, the model also suggests identifying the star employees of the organization and employees with negative megaphoning based on their respective network

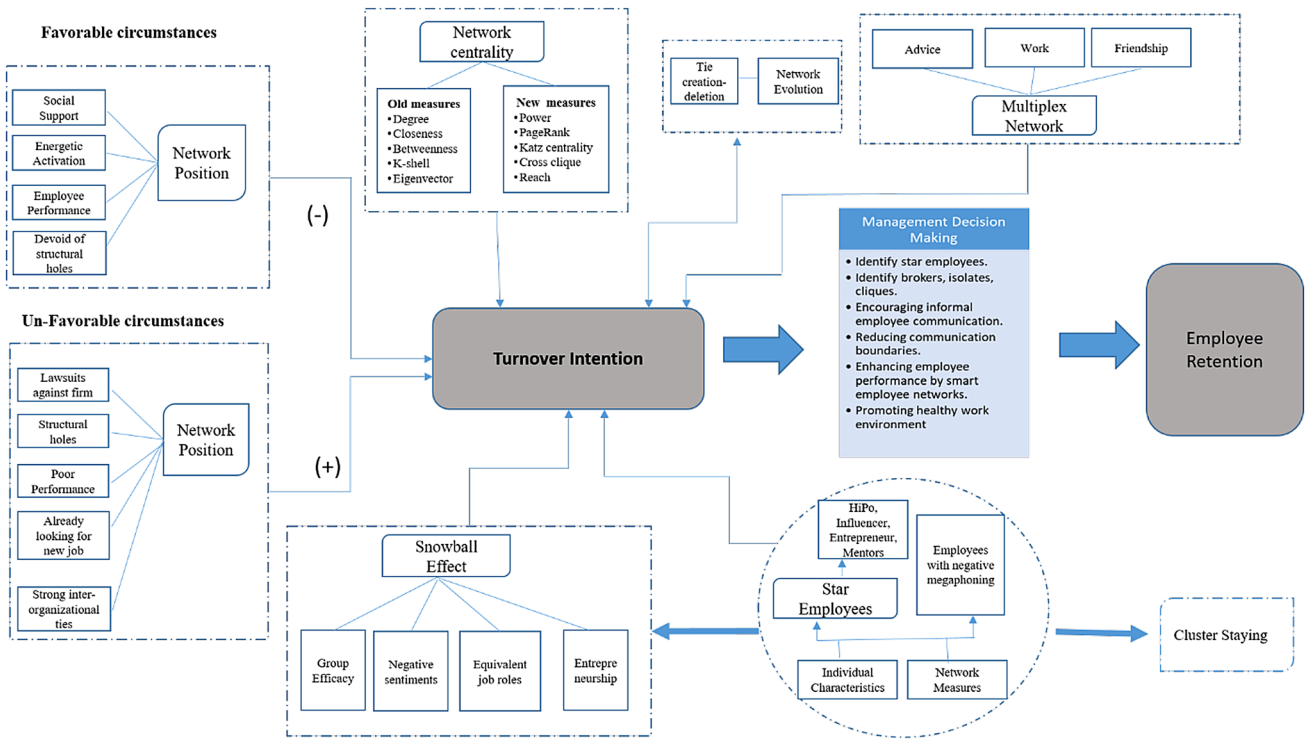

Fig. 2 An employee retention conceptual model for management decision-making

measures to predict their turnover intent. Combining all the aforementioned constructs resulted in an employee retention conceptual model. The top management decision makers of any organization can make use of this retention model to reduce communication boundaries between different employee networks, promote informal networks, enhance employee performance by encouraging smart networks, introduce a healthy working environment, and thus mitigate voluntary turnover and enhance retention.

The detailed description of the all elements of the conceptual model is mentioned below.

Firstly, for *network position*, the model suggests considering 'favorable' and 'unfavorable circumstances' for the employees. The analytical summary of network position from the past studies suggests that different network positions have a varying impact on turnover based on the external circumstances. Future studies can make use of this conceptual model to enhance retention by taking into account the varying nature of organizational networks, along with favorable and unfavorable work conditions (Fig. 2).

Secondly, for *network type,* the conceptual model considers investigating the multiplex heterogonous networks of advice, friendship, work, and common projects simultaneously. Since organizational networks are usually quite complex and mostly intertwined with each other, examining the heterogeneous networks provides a deeper understanding of the superimposed networks of workplace. Contrary to this, the majority of the networks in the past were investigated from a simplex viewpoint in which networks were examined in isolation which was not very practical. To cater for this insufficiency, our conceptual model suggests using heterogeneous networks in future.

Thirdly, for *network measure,* our retention model suggests that for better reliability of results and cross validation, multiple centrality measures should be computed instead of relying upon a single SNA measure which limits the result outcome. This consideration was missing in earlier studies. The conceptual model also enlists the old and new centrality measures used in network turnover studies.

Fourthly, star individuals should be identified based on their SNA measurement and specific personality traits. Through this method, we can categorize employees on a deeper level instead of only identifying focal and peripheral employees which are already discussed in literature multiple times. Fifthly, after identifying the star performers, their turnover should be predicted, followed by analyzing the snowball effect on other employees. Since every star performer might generate a unique quit propensity, their turnover decision will either stimulate cluster leaving or promote cluster staying; thus, by predicting the snowball effect, collective employee turnover can be reduced.

An extension to this model could be to identify those individuals with negative communication pattern, who impede firm performance. Literature suggests that not every individual contributes equally toward promoting a healthy working environment; there may be some employees whose behavior is detrimental to other employees' wellbeing or whose actions are harmful to organizational reputation (Lee and Kim 2020; Silvia and Alessandra 2018). Identifying employees with negative megaphoning in parallel to the star performers will help to retain the individuals most beneficial to the organization and get rid of the black sheep. By adopting the conceptual model presented in Fig. 2 of this study, managers can identify the key employees who are at risk of quitting and possibly mitigate their voluntary turnover. Such an effort will aid in creating a productive and healthy working environment.

6 Discussion and conclusion

To our knowledge, this systematic review is the first to analyze different network construct of SNA for formulating an employee retention conceptual model for HRM, GM, and KM practices. The aim of this study was to identify the knowledge gaps by examining the major recent contributions on the application of SNA on employee turnover. Thirty articles were identified after an extensive literature search, suggesting that this area of research is still underexplored, with great potential for future studies. We found a diverse range of factors constituting favorable and unfavorable work conditions influencing social network parameters and employee turnover.

Four trends emerged when examining employee turnover in organizations, namely *network position*, *network centrality*, *types of networks,* and the *snowball effect* of turnover. We found that different centrality measures of SNA can help identify individuals who are focal in their network, lie on the periphery and are brokers. Research indicates that whichever network position an employee occupies in an organization either positively or negatively correlates with their turnover decision. As opposed to the established concept of the past that central employees tend to have lower turnover propensity, we found many articles negating this concept based on the argument that unfavorable conditions can stimulate a highly connected central employee to quit. Social support, energetic activation, and individual performance influence the turnover decision of central employees. The same was observed for network centralities when an employee with higher degree centrality does not always have a reduced turnover, unlike the traditional concept of network centrality. Many studies supported the earlier concept of network position and network centrality, but overall, the findings were contradictory suggesting more elaborate research is required in this area.

The most pre-dominant network measures used in literature were *degree* (in-degree, out-degree), *closeness*, *betweenness*, *k-shell scores,* and *eigenvector centrality,* and the most frequently studied networks were friendship and advice networks.

Turnover is not a random phenomenon; it occurs in groups—creating a snowball effect. This is especially true when a CEO or an influential employee resigns. Contagion turnovers were also observed in instances of group efficacy, common projects, equivalent job roles, entrepreneurship, and negative sentiments toward organization.

The majority of studies focused on how social networks instigate the thought process of employee turnover, but some have hypothesized that turnover intention of employees shape up their friendship and advice networks in the future (Gloor et al. 2017; Troster et al. 2018). Finally, the studies in this review convincingly demonstrate turnover theory is more nuanced with regards to the relational aspect of employees.

Previous research has primarily focused on determinants of turnover within a social network context, whereas no attention has been given to developing an employee retention model. While it may signify an elusive distinction in representing an important organizational aspect, developing a retention model, however, opens new prospects for better management of human resources. The focus shifts from the argument "will they go" to "will they stay" which offers more potential benefit for organizational decision-making. To fill this gap in literature, our research proposes a conceptual model that maps employees' social network parameters to enable managers to identify the most productive employees of the organization and mitigate their intention to quit by considering the favorable and unfavorable work conditions. Since not all employees are equally valuable, identifying and retaining the best talent will prove to be fruitful for maintaining a competitive advantage for the organizations.

7 Limitations and future work

A detailed literature search was carried out based on the inclusion criteria to gather as many relevant articles as possible, but not every study in this field may have been identified. The study selection method to identify only those research papers that employed SNA techniques for analyzing voluntary turnover may have excluded those papers which did conduct SNA but did not include the keywords in the title or abstract of the studies. The principal contribution of this systematic review lies in identifying knowledge gaps in present studies and in the formulation of a new conceptual diagram for employee retention for future scholars and to highlight current avenues where SNA is applicable.

From this review, we found that the centrality measures most often used were closeness and betweenness, which are significant, but still do not capture many other variables known to turnover intention such as *PageRank*, *power,* and *reach* centralities. Future researchers should integrate a wider range of centrality measures for turnover.

The majority of the studies used the questionnaire approach for data collection (Mossholder et al. 2005; Labianca 2014), but this approach might introduce bias in the results because of the sensitivity of information used in SNA (e.g., who goes to whom for advice or who avoids whom at workplace). This review found only two studies in which actual interaction and e-mail communication of employees was analyzed for predicting turnover (Gloor et al. 2017; Yuan et al. 2016). There are other data collection methods for mapping actual social interaction of employees at workplaces, such as resource generator and position generator using data from call records, video conferences, or text messages. Future scholars could explore other modes of communication between employees for acquiring confidential data by obtaining prior permission from the employer and the employee.

Most of the studies in our review used the quantitative method of SNA, however, it will be beneficial for later studies if they also consider a mixed methods approach along with visual mapping of interaction patterns to get detailed insights into workplace relationships. We also suggest that future practitioners apply SNA techniques more deeply to specifically predict turnover of those employees who are more beneficial to the organization in terms of performance in addition to general turnover.

Although SNA has been applied in different organizations to study employees' behavioral patterns, no study encompasses employee retention strategies. Future studies might take this into consideration. Since social network analysis has added another dimension to theory, based on the gaps identified in this review it will be worthwhile to further incorporate reasons to quit into an employee retention model.

In one of the studies, Vardaman et al. (2012) investigated networks and organizational change reactions; future studies can explore the same by integrating the effects of social networks on turnover during change. It will be an interesting aspect to investigate in future.

Furthermore, owing to the negative impact of current pandemic Covid-19 on the business acumen and organizations, where businesses have been redefined in different parameters, there is a need to explore this aspect in future studies. Stemming from the Covid-19 regime when majority of the workforce had to shift from controlled office environment to 'work from home,' employee turnover has become even a bigger challenge for the companies since they had limited control on the employee work environment. The future

researchers should also cater for the new 'remote working conditions' of the employees while carrying out SNA.

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Declarations

Conflict of interest The authors declare that there is no conflict of interest. This research did not involve primary research involving human participation; therefore, issues of informed consent and ethics do not apply. Data used in this research have been derived from previously published peer-reviewed papers.

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