Promotion and resignation in employee networks

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H I G H L I G H T S

- Our data includes the employees' actual interactions and relations, free from questionnaire survey.
- Promotion and resignation are correlated with different structural features.
- Both the peripheral and central employees should be paid more attention.
- No matter work-related or social interplays, can be helpful to reduce the turnover risk.

A R T I C L E   I N F O

A B S T R A C T

Enterprises have put more and more emphasis on data analysis so as to obtain effective management advices. Managers and researchers are trying to dig out the major factors that lead to employees' promotion and resignation. Most previous analyses are based on questionnaire survey, which usually consists of a small fraction of samples and contains biases caused by psychological defense. In this paper, we successfully collect a data set consisting of all the employees' work-related interactions (action network, AN for short) and online social connections (social network, SN for short) of a company, which inspires us to reveal the correlations between structural features and employees' career development, namely promotion and resignation. Through statistical analysis, we show that the structural features of both AN and SN are correlated and predictive to employees' promotion and resignation, and the AN has higher correlation and predictability. More specifically, the in-degree in AN is the most relevant indicator for promotion, while the k-shell index in AN and in-degree in SN are both very predictive to resignation. Our results provide a novel and actionable understanding of enterprise management and suggest that to enhance the interplays among employees, no matter work-related or social interplays, can be helpful to reduce staffs' turnover risk.

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1. Introduction

Employees are the core and soul of enterprises, and thus human resources departments are always trying to get comprehensive understanding of employees and provide to managers valuable and effective suggestions. This issue has attracted much attention from interdisciplinary research domains. Some factors related to the employees' performance have been revealed, such as centrality [1,2], self-monitoring orientation [1], sex [3], and communication patterns [4]. Besides the performance, predicting and controlling resignation in advance are also valuable, since employees' resignation may result in great losses for enterprises. Freely and Barnett [5] showed that people being highly connected and in more central positions of the employee networks are less likely to resign. Ten years later, this group put forward that employees who reported a greater number of out-degree links to friends are less likely to resign [6]. Similar indicators include degree, betweenness and closeness [7,8].

Traditional studies are based on the data sets gathered from questionnaire survey that is probably subjective due to the psychological defense. Fortunately, recent IT development brings us more reliable information, such as email data [9], communication records [10], online social relations [11], contact networks built by wearable electronic sensors [4], and so on. In this paper, we collect anonymous employees' work-related interactions and social connections from a social network platform developed and used by a Chinese company consisting of more than a hundred employees, named Beijing Strong Union Technology Co. Ltd. (Strong Union for short). Accordingly, we can build two directed networks, action network (AN) and social network (SN), where nodes represent employees and links indicate the work-related interactions and social connections, respectively. A few studies have already shown that the employees being more central in the networks or with more connections to others are less likely to resign [5–8,12,13], while managers whose local networks are rich in structural holes could be promoted faster [14]. Here, we take more structural features into consideration to reveal the correlations between topology and career changes. In addition, we would like to show which network is more related to promotion or resignation.

The two networks characterize relationships among employees from different aspects. AN reflects work-related interactions such as downloading working files and working blogs within working groups, while SN reflects social connections among all employees of the company, through which employees can share their family and entertainment activities (usually not related to works) with others. Via statistical analysis, we find that the structural features of both AN and SN are correlated and predictive to employees' promotion and resignation, and the AN has higher correlation and predictability. More specifically, the in-degree in AN is the most relevant indicator for promotion, while the k-shell index in AN and in-degree in SN are both very predictive to resignation.

This paper is organized as follows. Section 2 presents the description and basic statistics of the data set. The significance of selected structural features and logistic regression are respectively shown in Sections 3 and 4. At last we give our conclusions and discussion in Section 5.

2. Data description

Ethics statement: This study was approved by the Ethics Committee of University of Electronic Science and Technology of China. The methods and data collection were carried out in accordance with the approved guidelines.

The data set is gathered from a social network platform which involves all the 104 employees in Strong Union until the end of 2013. It consists of two types of information, work-related actions and online social connections. The work-related actions of employees include reposting and commenting working blogs, assigning and reporting working tasks, and downloading working files. The online social connections, which are similar to the follower–followee relationships in www.twitter.com, are created regardless of working groups, namely everybody can build relationships with others even if they do not belong to any common working groups. Accordingly, we can build two directed networks, action network (AN) and social network (SN), where nodes represent employees and links indicate the work-related interactions and social connections, respectively. More specifically, a link from u to v in AN means the employee u has reposted, commented or downloaded v's working files, and a link from u to v in SN means u has followed v. To the date of the data collection, 25 employees had resigned and 12 employees were promoted.

Table 1 summarizes the basic topological features of the two networks. Compared with AN, SN is of higher density and average degree. The two networks are both of high clustering coefficients, quite small average shortest path lengths and very small modularity, since they are so dense that all the nodes are grouped together. Different from many known social networks [15], the two networks are both highly disassortative. It is because many work-related interactions and social connections happen between leaders and ordinary employees: the former are usually of large degrees while the latter are usually less connected.

3. Significance of structural features

Previous studies suggested that some structural features of employees are effective to evaluate the resignation [5–8,12,13]. Here we select three well-known indicators in-degree (k_i), out-degree (k_o) and k-shell index (k_s). Given a network G, k_i is the number of links pointing to a node and k_o is the number of a node's outgoing links. k_s of a node is the largest number such that this node belongs to the k_s-core, which is the maximum subgraph of G in which all nodes have degree no less than k_s [19]. In the calculation of k_s, the networks are treated as undirected ones. This index defines