

Potential to Foster Relationships and Reduce Early Turnover by Assigning New Employees to Younger Teams based on Formal and Informal Relationships

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Abstract

The early turnover rate of Japanese university graduates has remained at approximately 30% over the past 30 years, mainly because of poor human relations within companies. To the best of our knowledge, no previous study has examined early turnover from the perspective of both formal and informal relationships. We propose an organizational structure for companies that reduces early turnover by considering both formal and informal relationships. A simulation model was developed to evaluate the effects of such relationship networks on early turnover. To inhibit the early turnover of new employees, we recommend forming teams of younger existing employees and assigning new employees to such teams. The simulation results show that the proposed corporate organizational structure is more effective in reducing early turnover than the existing top-down corporate structures.

Keywords: Affective Commitment, Early Retirement, Simulation, Social Network.

1 Introduction

The early turnover of new graduates in Japan who leave their jobs within three years of graduation is affected by the economic climate. However, for university graduates, it has remained at approximately 30% over the past 30 years. If early job turnovers occur owing to reasons other than mismatches between new graduates' expectations and the actual work or a bad working environment, they can be detrimental to both sides. Early turnovers can impede the acquisition of skills by new graduates and cause employers to fail to invest in human resources. The top three reasons for leaving a full-time job for the first time are physical and mental health problems, poor working hours and vacation conditions, and poor human relations [2]. Hence, measures to prevent early job turnover should not only include improving compensation and the working environment, but also human relations. In addition, as the average age of workers increases [3], the gap between the average age of new graduates and existing employees tends to widen, which can affect the establishment of human relations within the company.

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From a human relations perspective, organizational commitment, which expresses employees' sense of belonging and relationships, is related to the suppression of employee turnover and improvement in the performance of organization members. In particular, affective commitment, which expresses attachment to an organization, is believed to be effective in reducing employee turnover [4]. Previous studies that discussed job turnover by combining affective commitment and internal relationships included reports from the perspective of a company's organization, which is a formal relationship [5–10], and reports from the perspective of intra-company friendships, which are informal relationships [11–15]. In addition, in social network theory, the homophily effect, in which people tend to connect with those who have similar attributes, is observed when age is used as an attribute [16]. In [17], a survey was conducted and the results indicated that people of the same age tended to discuss important matters with each other [17]. Previous studies have discussed early turnover by deriving affective commitment from the perspective of either a formal or informal relationship. However, no studies have considered both perspectives.

In this study, we developed a simulation model that considers both formal and informal relationships within a corporation. Based on the model, we propose an organizational structure to combat the early turnover of new employees. The remainder of this paper is organized as follows. Section 2 defines the problem and describes our proposed solution. Section 3 describes the newly developed simulation model based on previous models. Section 4 presents a new model for a company's organizational structure that can be effective in reducing early turnover rates. Section 5 explains the parameter settings and compares three different corporate organizational structures through simulations. The simulation results are presented in Section 6, and the study is summarized in Section 7.

2 Problem Definition and Methodology Overview

This study aims to propose an organizational structure based on the perspectives of both formal and informal relationships within a company that is effective in reducing the early turnover of new employees. We extend the model of a previous study [5–15] and develop a simulation model that considers both formal and informal relationships within a company. Network theory is used to simulate the relationships within a company. Based on the simulation model, we propose that a specific countermeasure against early turnover is to create a team of existing young employees and assign newly hired employees to this team.

3 The Proposed Simulation Model

The simulation model proposed in this study is based on previous research on the impact of human relationships on early turnover. We first explain the model used in previous studies and then present our new simulation model.

3.1 Simulation Model in Previous Studies

Previous studies have discussed turnover by deriving affective commitment from the perspective of either a formal or an informal relationship.

In formal relationships, degree centrality and structural holes in the nodes affect affective commitment. The degree is the number of connections of a node in a network that indicates its importance in the network. A high degree indicates that a node has many connections, whereas a

low degree indicates that a node has only a few connections. Degree centrality [18] is expressed as

$$\text{Degree Centrality} = n / (N - 1) \quad (1)$$

n : the degree of the node, N : total number of nodes in the network.

According to Lee et al. [5], when the degree centrality of a node for an employee is moderately high, the node has many connections and is important in the workplace. Therefore, there is increased attachment to the organization. However, when the degree centrality is extremely high, the workload of the employee becomes excessive, and attachment to the organization may decrease.

Burt [19] defined a network consisting of a single node (*ego*), nodes directly connected to that node, and all connections between them, and defined structural holes as a state in which nodes directly connected to the *ego* are not connected. In this study, we use efficiency, as defined by Borgatti [20] and based on the previous works of Burt [19] and Borgatti [21], as a measure of structural holes. The *ego* efficiency of an unweighted, undirected graph is expressed by Eq. (2), with higher values indicating more structural holes in the *ego*.

$$\text{Efficiency} = (m - 2t / m) / n \quad (2)$$

t : the number of ties in the *ego* network (not including ties to the *ego*),
 m : the number of nodes (excluding the *ego*), n : the degree of the *ego*.

Network graphs illustrating the structural holes are shown in Figure 1. The network graph on the left in Figure 1, viewed from the *ego*, has many structural holes. The presence of an *ego* is a state in which the other nodes have connections. For example, if the *ego* disappears, there will be no relationship between the other nodes; and therefore, no cooperation or information transfer. In other words, the *ego* is irreplaceable in its social role within the network [19]. The network graph on the right in Figure 1, viewed from the *ego*, has fewer structural holes. Each node has connections to nodes other than the *ego*. If the *ego* disappears, it will not affect information transfer or cooperation because there is a connection between nodes that do not involve the *ego*. In other words, the *ego* is not irreplaceable in its social role within the network. However, a dense network allows each node to assist others [22].

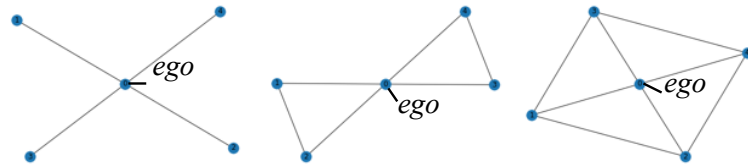


Figure 1: Left: many structural holes, Central: middle structural hole,

Right: fewer structural holes

According to Lee et al. [5], in the presence of a large number of structural holes in formal relationships in a company, that is, when network connections are sparse, the *ego*'s existence plays an irreplaceable social role in the transmission of information, relationships, and organizational roles, which is expected to increase their significance within the organization. In the case of a small number of structural holes, that is, when network connections are tight, reputation, recognition, and news spread quickly. This is assumed to have a positive effect on attachment to the organization because opportunistic behavior, such as a reluctance to help others, is suppressed due to the fear of the spread of news. However, because of the substitutability of relationships, their significance is not enhanced by irreplaceable social roles, as is the case with many structural holes. When the number of structural holes is moderate, both the irreplaceability of the social role and the suppression of opportunistic behavior are weakened.

Friendship in the workplace, which is an informal relationship, has been measured using a Likert-scale questionnaire. According to Hsu et al. [23], friendships in the workplace have a positive direct effect on attachment to the organization. Marsden [17] examined the patterns of the questionnaire results for the age, education, race/ethnicity, religion, and gender of people with whom they had discussed important issues up to six months earlier. They found that those with the same parameters were more likely to discuss the same issues.

Organizational commitment refers to the connections that employees experience in an organization. Developing organizational commitment has a positive impact on preventing early turnover. Employees feel that they are important to the organization, collaborate more effectively with colleagues, and have increased productivity [24–27]. Allen et al. [28] classified commitment into three categories: affective, continuous, and normative. Affective commitment refers to the affection for and attachment to a company. Continuous commitment refers to the cost consciousness of leaving an organization. Normative commitment refers to the need to follow the norms and rules of an organization. Meyer et al. [29] reasoned that affective commitment has a stronger effect on employee retention and civic behavior than normative or continuous commitment. According to Hsu et al. [23], affective commitment has a negative direct effect on the intention to leave.

3.2 New Simulation Model and Parameter Settings

The proposed model uses network graphs to calculate affective commitment in both formal and informal relationships to identify people with a tendency to leave their job early.

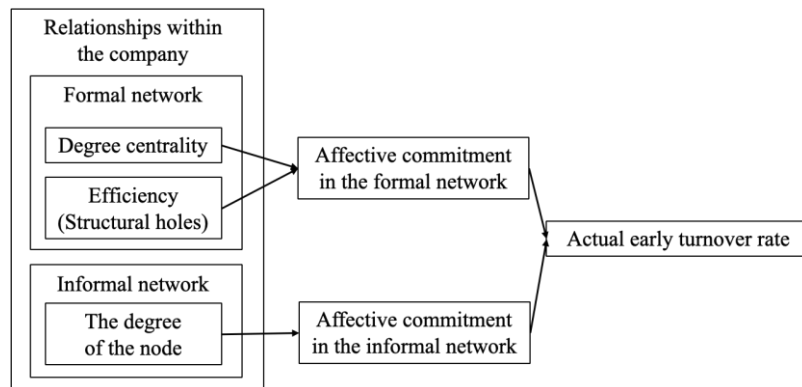


Figure 2: Schematic diagram of the proposed simulation model

A schematic of the proposed simulation model is shown in Figure 2. We created a formal network graph showing work relationships and an informal network graph showing friendships within a company. From the formal network graph, affective commitment was calculated from the degree centrality and efficiency. In the informal network graph, the affective commitment was calculated from the degree of the node, that is, the number of friends. The probability of a young worker leaving the organization in one year was calculated using the affective commitment in the formal and informal network graphs.

In this study, we further added the following conditions. As these simulations were based on Japanese data, the age distribution of existing employees was based on Japanese labor force statistics by age group for the year 2021 [30]. In our simulations, we first calculated two types of affective commitment that represent attachment to the organization from two types of networks: a formal network, which represents the company's organizational structure, and an informal network, which represents friendships within the company. We then estimated the number of people who were likely to quit their job early based on the two inferred affective commitments. The nodes included 100 existing employees and 1–40 newly hired employees. The parameters included ages of 10, 20, 30, 40, 50, and 60 years for existing employees and an age of 20 years for new employees. Only newly hired individuals were considered eligible for turnover.

3.2.1 Calculation of Affective Commitment in Formal Networks

A formal network graph was created with 100 existing employees under the conditions described in Section 5, and new employees were added to the network graph. The affective commitment of each new employee to formal relationships is defined in this study using Eq. (3) based on the results of a previous study [5].

Affective Commitment in the Formal Network

$$= (-20x^2 + 16.8x + 6.86y^2 - 8.708y + 14.238)/30 \quad (3)$$

x: degree centrality, *y*: efficiency.

3.2.2 Calculation of Affective Commitment in Informal Networks

New employees were added to the informal network of existing employees under the conditions described in Section 5. According to the homophily effect of age, employees are more likely to make connections with people close to their age. Referring to Marsden's statistical results [17] regarding the age of a person with whom one discusses important things, the probability of an employee establishing a connection with other employees based on age is defined in Table 1. The probability of having a connection is higher between individuals of similar ages and lower between individuals of different age groups. For example, if an employee is less than 30 years old, there is a 49% probability of making a connection with another employee of age less than 30. However, the probability drops to 5% if the other employee is in their 60s.

Table 1: Probability of an employee making a connection with another employee based on their age

		The other employee's age				
		<30	30s	40s	50s	60s
Employee's Age	<30	0.49	0.16	0.16	0.14	0.05
	30s	0.17	0.46	0.16	0.12	0.10
	40s	0.13	0.26	0.37	0.13	0.11
	50s	0.13	0.16	0.19	0.33	0.17
	60s	0.04	0.14	0.15	0.24	0.43

The affective commitment of each new employee due to informal relationships is defined in Eq. (4) after adjusting the parameter to the 30% early turnover rate in Japan at the top-down of Pattern B in Section 5.

$$\text{Affective Commitment in Informal Network} = 0.08z \quad (4)$$

z : the degree of the node.

3.2.3 Estimation of Early Turnovers from Two Affective Commitments

The sum of the affective commitments calculated in Eqs. (3) and (4) was used as the overall affective commitment, considering both formal and informal relationships. In this study, the actual early turnover rate is defined in Eq. (5), referring to the relationship between affective commitment and turnover intention by Hsu et al. [23] and the relationship between turnover intention and the actual turnover rate by Doug et al. [31].

$$\text{Actual Early turnover rate} = e^{0.136((-0.3 \times AC + 0.48)/0.48) \times 31} - 4.273 \quad (5)$$

AC : sum of affective commitments in the formal

and informal networks.

Disengaged employees were removed from networks in both formal and informal relationships. While the turnover rates in the cited studies refer to one-year periods, the early turnover rate refers to the turnover rate of new employees during the first three years of employment. Therefore, we repeated the process three times, calculating the affective commitment from each network graph to estimate the early turnover of new employees and removed them from the graph. The total number of new employees who left the company was recorded as the number of early turnovers.

4 Proposed Organization Structure

Figure 3 shows a process diagram for creating the proposed organizational structure for the case of 15 existing employees, 3 team members who accept new employees, and 4 new employees. The proposed organizational structure is similar to that of a top-down company, consisting

of one manager and several teams, with one member of each team serving as the middle management. According to the proposed method, a team of existing younger employees is created that accepts new employees (Step 1 in Figure 3). One manager is selected to organize the team with the remaining employees (Step 2 in Figure 3), and multiple teams of other employees are created (Step 3 in Figure 3). Step 3 creates teams regardless of the age, unlike the teams created in Step 1. In the example in Figure 3, three teams are created consisting of three, three, and four members. The middle managers in each team is created in Steps 1 and 3, and the managers selected in Step 2 are assumed to be connected. However, team members who are not middle managers are not connected to other team members. New employees are always assigned to a team comprised of younger workforce members created initially (Step 4 in Figure 3). We believe that placing newly hired employees in the same team as younger employees positively affects the ease of establishing friendships in informal networks. However, in formal networks, the number of people working together affects the degree centrality, and the connections between people working together affect structural holes. Therefore, the optimal team size should be examined. The optimal team size is discussed in Section 5.

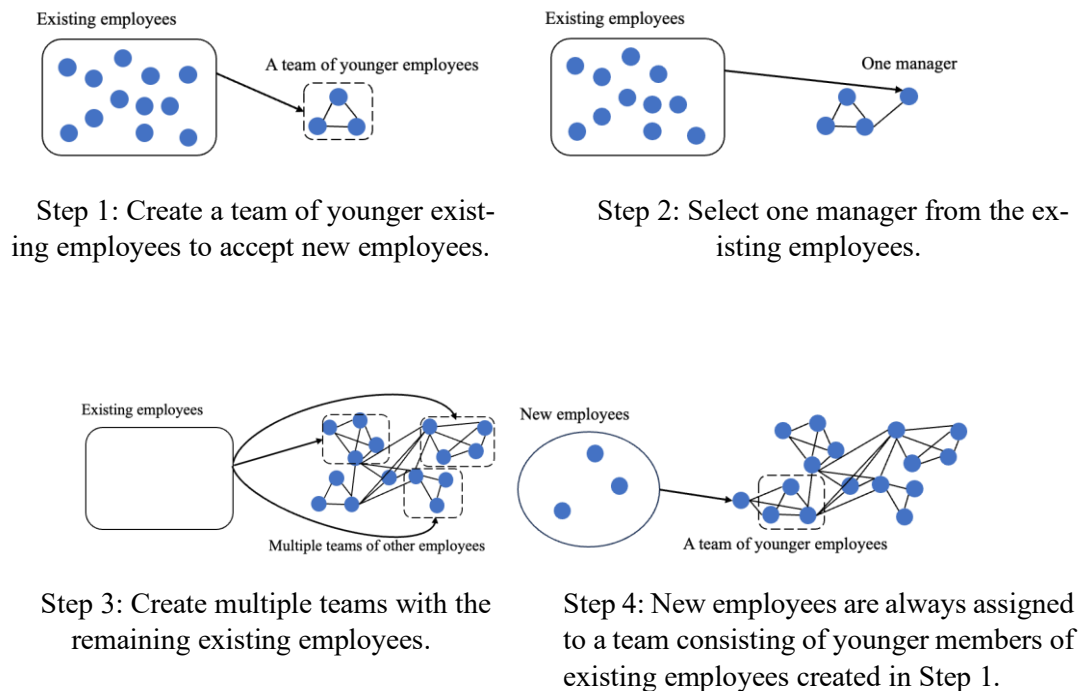


Figure 3: Process for creating the proposed organizational structure (15 existing employees; 3 team members accepting new employees; 4 new employees)

5 Organizational Structure and Friendship Patterns

We compared the number of employees who leave their jobs early in the following three organizational structures: Pattern A, as proposed in this study; Pattern B, which mimics a top-down organization; and Pattern C, which is an organization with no upper or lower levels. Patterns A, B, and C were simulated under the following conditions:

- Informal and formal network graphs were created using new employees and existing employees as nodes.

- The number of existing employees was fixed at 100.
- The parameters for existing employees were age distribution (10s, 20s, 30s, 40s, 50s, and 60s), based on Japanese Labor Statistics [30].
- New employees ranged from 1 to 40.
- The age parameter for new employees was assumed to be in the 20s.

Python programming language was used for the comparison of the organizational structures, and the NetworkX library was used.

5.1 Team of Younger Existing Employees

The number of existing employees was assumed to be 100. In this pattern, a team of younger employees was created, which accepted new employees. To compare the effect of the number of teams on the reduction in the number of early turnovers, in this study, we considered 30, 50, and 90 team members. The manager was randomly selected from among the remaining employees. Finally, we created three teams of equal size from the remaining employees. In the formal network graph, one middle manager was selected from each of the four teams, and the team members, managers, and other middle managers were connected. The informal network graph was connected to all the nodes in the team with probabilities based on Table 1. New employees were assigned to the young teams that accepted them. The formal network graph connected all employees to all nodes in the team, and the informal network graph connected all nodes in the team to each other with the probabilities listed in Table 1.

Figure 4 shows the formal and informal network graphs created when thirty team members accepted one new employee. The upper-right part of the informal network is a team composed of younger existing employees to accommodate new hires, indicating that they are closely connected. This finding indicates that age-related homophily drives closer friendships within a company.

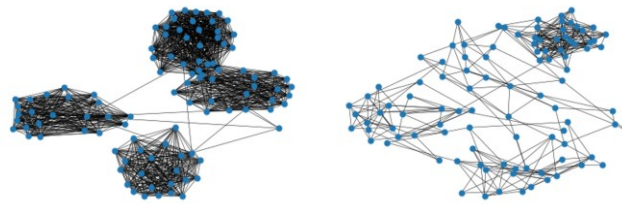


Figure 4: Left: Formal network, Right: Informal network

(Number of team members accepting a new employee = 30; number of new employees = 1)

5.2 Top-down Organization

We randomly selected five teams with 20, 20, 20, 20, and 19 employees, and assigned one manager from the 100 existing employees. In the formal network graph, one middle manager was selected from each of the five teams, and the team members, managers, and other middle managers were connected. In the informal network graph, all nodes in the team were connected with probabilities based on Table 1. New employees were randomly assigned to one

of the five teams. In the formal network graph, they were connected to all employees in the team. In the informal network graph, they were connected to all employees in the team with probabilities based on Table 1. The formal and informal network graphs of the new employees are shown in Figure 5.

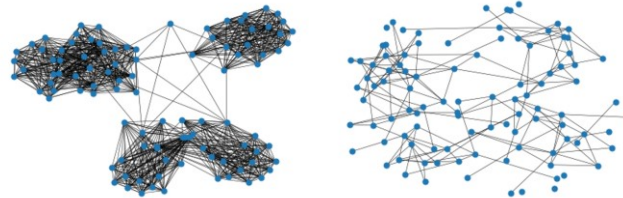


Figure 5: Left: Formal network, Right: Informal network

(Number of team members accepting a new employee = 19 or 20,
number of new employees = 1)

5.3 Flat Organization

In the formal network graph, all 100 existing employees were connected to all nodes, and in the informal network graph, all nodes were connected to all existing employees with probabilities based on Table 1. New employees were connected to all employees in the formal network graph and to all employees in the informal network graph with probabilities based on Table 1. The formal and informal network graphs of the new employees are shown in Figure 6. In a formal network, each employee is closely connected to all the other employees.

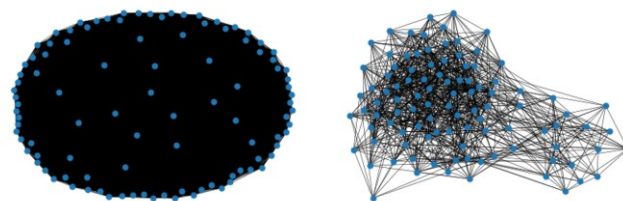


Figure 6: Left: Formal network, Right: Informal network

(Number of team members accepting a new employee = 100; number of new employees =
1)

6 Results and Discussion

The simulation results are presented in Figures 7 and 8. Figure 7 shows the results of the study on the effect of the size of the team that accepts new employees on early turnover in the proposed

organizational structure of the company discussed in Section 5. Figure 8 shows the results of a comparison of the effects of the proposed organizational structure (Pattern A), top-down organization (Pattern B), and flat organization (Pattern C) on early turnover. A random seed was fixed, and for each pattern, 32 simulations were run with 100 existing employees plus 1–40 new employees.

6.1 Effects of Team Size on Accepting New Employees

Figure 7 shows the distribution of the number of early turnovers relative to the number of new employees and their averages for Pattern A when the number of team members accepting new employees is 30, 50, or 90 among the 100 existing employees.

The number of early turnovers per 100 existing employees is less than one for each team size. For a larger team size, the number of early turnovers is lower. This may be because in an informal network, potential friends are employees in the same team, and in a larger team, there are more friends, and more affective commitment in the informal network. When the number of accepted team members changes from 50 to 90, the reduction in the number of early turnovers is smaller than that when the number of accepted team members changes from 30 to 50. As the size of the team increases, the number of friends also increases. However, in the formal network, the degree centrality of new employees is excessively high in a team of 90 members compared with a team of 50 members. This may lead to lower affective commitment in the formal network for the 90-employee team than the 50-employee team.

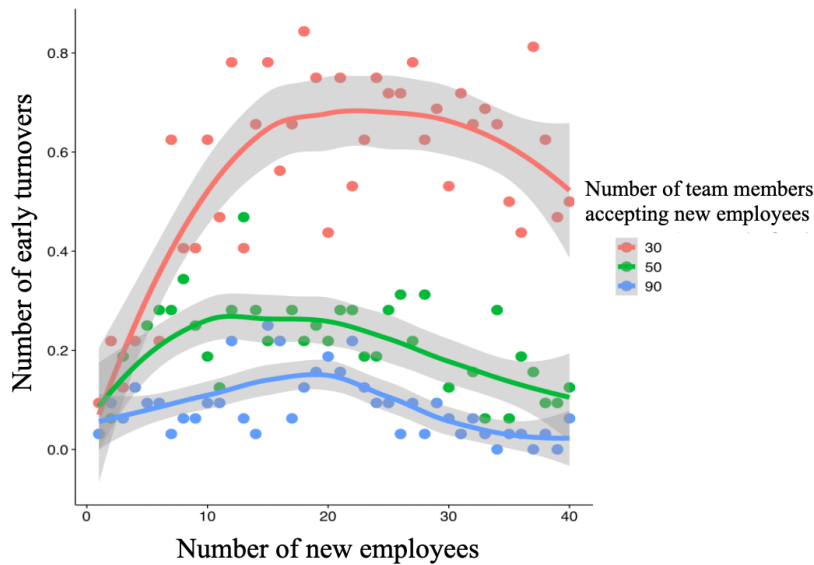


Figure 7: Comparison of the number of early turnovers in Pattern A

6.2 Organizational Structure Effective in Preventing Early Turnover

Figure 8 compares the number of early turnovers relative to the number of new employees in patterns A, B, and C when the team accepting new employees in Pattern A has 50 members. In Pattern B, which simulates a realistic top-down organizational structure, the parameters are set such that when the number of new employees is approximately 10, the number of early turnovers is approximately 3, which corresponds to an early turnover rate of approximately 30% in modern

Japanese society.

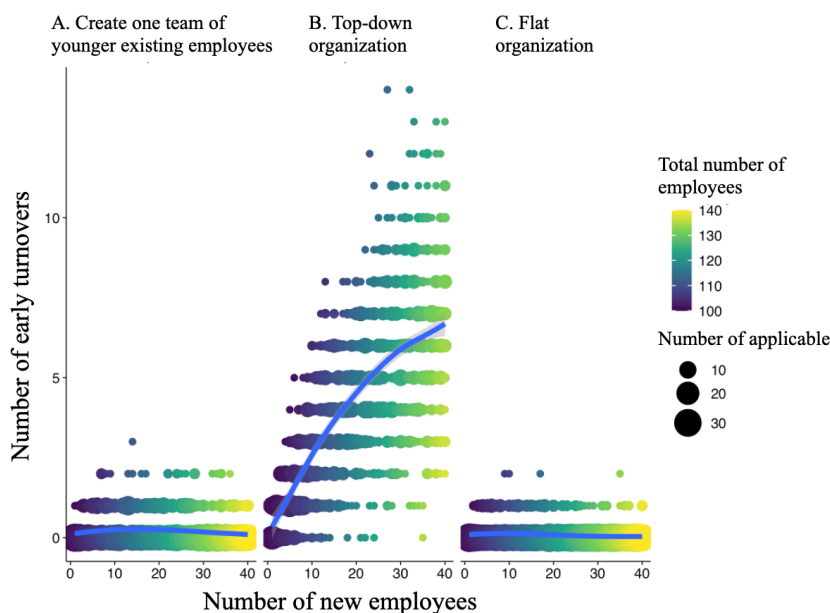


Figure 8: Comparison of the number of early turnovers between each pattern

Pattern *C* exhibits the lowest early job turnover rate. This is because the number of friends and affective commitment in the informal network increase as potential friends are all employees, including existing and new employees. In addition, the size of the team accepting new employees in Pattern *A* is 100, that is, the same situation as when the team is composed entirely of existing employees. However, Pattern *A*, in which the team comprised 50 young existing employees, and Pattern *C*, in which all employees formed a single team, as proposed in this study, show little difference in the number of early turnovers. This may be because the degree centrality of Pattern *C* is excessively high. New employees are connected to all employees in the formal network, and the affective commitment in the formal network is low. In Pattern *A*, the structural holes and degree centrality are close to their optimal values and the affective commitment in the formal network is high. Pattern *C* is likely to result in excessively large teams, which can lead to inefficiencies.

Compared with Pattern *B*, which mimics reality, Pattern *A* has fewer employees who leave their jobs early. Additionally, the difference in the number of early turnovers increases with the number of new employees. Both formal and informal structures seem to be more effective against turnover than conventional organizational structures. When the size of the company organization is small, Pattern *C* can also be considered as a solution.

6.3 Discussion

Figure 8 shows that there is no significant difference between a flat organization and the proposed organizational structure when the size of the team accepting new employees is 50. In Figure 7, the effect of early turnover increases as the team size increases. However, based on the results in Figure 8, the proposed team size of 30% of existing employees is considered sufficient to accept new employees.

According to Figure 7, the number of early turnovers peaks when there are 20–30 new employees. In the proposed organizational structure, the number of new employees should be less than 20 or greater than 30 when the number of existing employees is 100.

In the simulation, we analyzed early turnover when new employees joined a company for the first time. If new employees join the proposed team in the next year or beyond, the team's senior employees must be transferred to another team. To avoid increasing the team size, the number of senior employees to be transferred should be the same as the number of new employees accepted. The number of new employees should not be too large compared with the size of the younger team. In the proposed organizational structure, the effect on early turnover is observed when there are fewer than 20 or more than 30 new employees. If there are more than 30 new employees, an equal number of existing employees can be transferred to different teams, which means that the remaining employees have only one or two years of tenure. As a concrete example, let us assume that the size of the young team accepting a new employee is 30, and the tenure of the team is five years. As all young team members are replaced within five years, the company accepts seven to eight new employees each year. Without the transfer of senior employees to other teams, other teams would shrink because of retirement and other factors, and only the team to accept new employees would have additional staff. Finally, the proposed organizational structure of the company is the same as that of a flat organization.

In formal relationships, the degree centrality and structural holes of the new-hire node, i.e., the new employee can affect the affective commitment of the new employee. The degree of the node indicates the number of people that the employee must work with on the job. By transferring the same number of senior members from a team (that accepts new employees) as the number of new employees accepted, the size of the team can be maintained. By maintaining the team size, the increase in the number of new employees involved in the job is controlled and a decrease in affective commitment in terms of the degree centrality can be prevented. However, employees are more closely connected if they are not transferred to accommodate new employees. Affective commitment is likely to be higher in terms of structural holes. Both the proposed and flat organizational structures have a higher degree centrality. Therefore, both organizational structures are expected to have higher affective commitment. As a result, fewer early turnovers are expected in both organizational structures. By transferring employees to other teams, the team size can be maintained at a level that is effective in preventing early turnover without excessively increasing the size of the team.

According to the homophily effect, people are likely to be friends with people closer to their age. The converse is also true. Transferring a senior member of a team that accepts a new employee prevents an increase in the average age of the team. This makes it easier for new employees to make friends because of the homophilic effect of age in terms of informal networks.

7 Conclusion

This study proposes an organizational structure for a company in which only one team of young employees is formed to accept new employees as a measure to reduce early employee turnover. The proposed structure is compared with an existing organizational structure for a company using a simulation that considers formal and informal human relationships, and is shown to be effective in preventing early turnover. This study is focused only on human relations. A more effective organizational structure can be proposed by incorporating other

requirements, such as wages. In addition, the productivity of each organization is not considered. By adding productivity to the parameters, in the future, it will be possible to develop a corporate organizational structure that can be more useful in the real world.

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