

Simulation of the spread of turnover intention behavior through employee interaction in a digital work environment



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ABSTRACT

Turnover intention has become an increasingly complex issue in digital work environments due to the combined influence of employees' psychological conditions and social interactions. This study aims to analyze the dynamics of turnover intention diffusion using an agent-based modeling (ABM) approach. The model was developed in NetLogo with 100 employee agents and incorporated digital work stress, job engagement, organizational commitment, interaction intensity, and digital work environment quality as key variables. Simulations were conducted for 96 ticks, representing 24 months, across three scenarios: digital work stress, social diffusion, and organizational commitment. The simulation results indicate that higher digital work stress consistently increases turnover intention, while job engagement and organizational commitment help reduce this tendency. Social interaction intensity significantly accelerates the spread of turnover intention through a contagion effect, resulting in faster diffusion within highly connected employee networks. Furthermore, organizational commitment acts as a protective factor that promotes positive emergent behavior by reducing turnover intention and maintaining organizational stability. These findings demonstrate that ABM effectively captures how individual behavioral changes evolve into collective organizational patterns and provides a valuable decision-support tool for evaluating employee retention strategies in digital work environments.

Keywords: *Agent-Based Model; Turnover Intention; Digital Work Environment; Social Contagion; Organizational Commitment*



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INTRODUCTION

Human resources are a vital asset for organizations. However, many companies still face high employee turnover rates, which can lead to increased recruitment and training costs, loss of organizational knowledge, and decreased work productivity (Galan, 2023; Hinkin & Tracey, 2006; Shaw, 2011). With the development of digital work environments, interactions between employees occur not only in person but also through various digital platforms. This allows for a more rapid exchange of information, work experiences, and perceptions about the organization. As a result, turnover intention has the potential to spread from one employee to another through social interactions within the digital work environment, reflecting a contagion effect among employees (Usanova & Géraudel, 2024).

Research on turnover intention recently has shown that digital transformation has reshaped employees' work experiences and influenced their decisions to stay with or leave the organization (Felps et al., 2009). Previous research indicates that a supportive work environment, person-organization fit, and employee engagement affect employees' intention to leave in digital industries, making the characteristics of the digital work environment a crucial factor in employee retention (Winata & Martdianty, 2022). Furthermore, research on digital-based work and remote work indicates that the expectation to be constantly connected and available online can influence employee perceptions of the work environment and increase the likelihood of leaving the organization (Knardahl & Christensen, 2022). On the other hand, an employee's decision to leave an organization is not entirely individual, as it can be influenced by the contagion effect, a condition where the commitment and behavior of coworkers influence an individual's intention to leave (Usanova & Géraudel, 2024). These findings suggest that social interactions play a crucial role in shaping and spreading employees' intentions to leave. In line with these developments, the Agent-Based Modeling (ABM) approach has been used to simulate turnover behavior and evaluate various employee retention strategies (Davissyah et al., 2025). However, this research has focused on predicting turnover and the effectiveness of organizational interventions, so the process of spreading turnover intention through interactions between employees in a digital work environment remains understudied.

Based on previous research, it is known that the digital work environment can influence employee turnover intention, while social interactions between employees also have the potential to create a contagion effect that influences individual work behavior and decisions (Felps et al., 2009; Knardahl & Christensen, 2022). However, research that integrates these two aspects to capture emergent behavior that arises from interactions between agents within an organization is still very limited. Therefore, this study aims to simulate the spread of turnover intention through interactions between employees in a digital work environment using an agent-based modeling approach. This research is expected to provide a deeper understanding of the patterns of turnover intention spread, the influence of social interactions on changes in turnover intention, and the dynamics that emerge as a collective phenomenon within the organization. Thus, this research is expected to provide an academic foundation in the development of organizational behavior simulation models while providing recommendations for organizations to develop more effective employee retention strategies in an increasingly digitalized work environment.

Based on these research gaps, this study seeks to answer how turnover intention spreads through social interactions in the digital work environment, how digital work stress, job engagement, and organizational commitment influence these dynamics, and

how the contagion effect generates emergent behavior at the organizational level using an agent-based modeling approach. More specifically, this study formulates the following three research questions:

1. How does turnover intention spread through social interactions in the digital work environment?
2. How do digital work stress, job engagement, and organizational commitment influence turnover intention?
3. How does the contagion effect generate collective behavior (emergent behavior) in organizations?

LITERATURE REVIEW AND RESEARCH FRAMEWORK

Turnover Intention

Turnover intention is defined as an employee's reported willingness to leave the organization within a given period of time (Lazzari et al., 2022). In human resource management studies, turnover intention is often used as an early indicator to predict the likelihood of actual turnover because the decision to leave an organization is generally preceded by the intention to change jobs (Lazzari et al., 2022; Wong & Cheng, 2020).

Turnover intention does not emerge suddenly but rather results from various work experiences an individual has had while working in an organization. Factors such as job stress, low work engagement, weak organizational commitment, and an unsupportive work environment can increase a person's tendency to seek alternative employment (Manuaba & Suwandana, 2022; Rahayu et al., 2022; Xue et al., 2022). Turnover intention is an employee's conscious and deliberate desire to leave an organization and can be used as a predictor of actual turnover (Bothma & Roodt, 2013). These findings suggest that intention to leave an organization can be used as an indicator to understand the likelihood of future turnover. Therefore, turnover intention is one of the most widely used variables in research on human resource retention and sustainability in organizations.

Digital Work Stress

Digital work stress is defined as a form of stress arising from the use and widespread presence of digital technologies in the workplace (Riedl et al., 2023). Developments in information technology have changed the way employees work, communicate, and collaborate, creating new demands that individuals cannot always adapt to easily (Battisti et al., 2022; Charles et al., 2022). This pressure can stem from the need to be constantly connected to work, the simultaneous use of multiple digital platforms, and the increasingly blurred boundaries between work and personal life.

The increasingly intense digital transformation means employees face various new forms of pressure not previously encountered in conventional work environments. These conditions can lead to mental fatigue, difficulty separating work and personal time, and increased psychological burden due to the constant flow of information (Berger et al., 2024; Riedl et al., 2023). Research shows that digital stress is positively related to turnover intention and can increase employees' likelihood of leaving the organization (Puspita & Zamralita, 2023). These findings indicate that the higher the level of digital stress experienced by employees, the higher the likelihood of wanting to leave their jobs. Therefore, digital work stress is a significant factor influencing turnover intention in digital work environments.

Job Engagement

Job engagement is a positive, fulfilling work-related state of mind characterized by vigor, dedication, and absorption (Schaufeli & Bakker, 2004). Employees with high engagement tend to be more focused at work, demonstrate stronger motivation and dedication to achieving organizational goals, and exhibit greater involvement in their work. In a digital work environment, technology can be perceived differently by each individual. Some employees view technology as a source of pressure that increases workload, while others view it as a resource that helps complete work more effectively and efficiently (Schaufeli et al., 2002; Storm & Rothmann, 2003). These differences in perception can impact an employee's level of engagement in their work.

Employees who view technology as a resource demonstrate higher levels of work engagement, positive attitudes toward connectedness outside of work hours, and lower levels of burnout and intention to quit (Rasulova & Tanova, 2025). These findings indicate that job engagement plays a crucial role in creating a positive work experience and reducing employee turnover.

Organizational Commitment

Organizational commitment is a psychological state that characterizes an employee's attachment to the organization and affects their willingness to remain with the organization (Meyer et al., 1993). Organizational commitment reflects the extent to which an individual feels a part of the organization, accepts its values, and desires to maintain membership in the organization (Loan, 2020; Nisar & Rasheed, 2020; Novianti, 2021). Employees with high organizational commitment generally demonstrate greater loyalty, higher levels of engagement, and a stronger desire to remain with the organization. Conversely, low levels of organizational commitment are often associated with an increased likelihood of employees seeking alternative employment elsewhere (Chung et al., 2017; Loan, 2020; Nisar & Rasheed, 2020; Novianti, 2021).

Digital-based human resource transformation does not directly reduce turnover intention but influences it indirectly through job satisfaction, employee engagement, and organizational commitment (Munir & Lestari, 2026). These findings indicate that organizational commitment is an important factor explaining why employees choose to stay or leave an organization. Therefore, organizational commitment is often viewed as a key factor in efforts to increase employee retention.

Employee Interaction

Employee interaction is an interactive relationship among employees through which individuals influence one another by their actions, responses, and communication within the workplace (Baso et al., 2024). These interactions play an important role in the workplace because employees continuously influence one another through communication, actions, and responses during work activities (Baso et al., 2024). The development of digital technology has changed the patterns of interaction between employees. Communication is no longer limited to face-to-face meetings but also occurs through various digital platforms such as instant messaging applications, online collaboration systems, and virtual conferences (Battisti et al., 2022). This allows for the exchange of information and social influence to occur more quickly and broadly than ever before.

The quality of interactions and work relationships between employees plays a role in shaping individuals' perceptions of well-being and their perceived work experience (Mastroianni & Storberg-Walker, 2014). These findings indicate that social relationships

between employees play a crucial role in shaping employees' work experiences. Good social support can enhance working well-being, while less positive relationships can diminish the quality of the work experience within the organization.

Digital Work Environment

A digital work environment is a work environment supported by digital technology and encompasses various aspects of work, such as workspace, tasks, procedures, rules, communication, collaboration, and knowledge management (Mičić et al., 2022). The digital work environment serves not only as a means of utilizing technology but also as a work system designed to increase employee productivity and effectiveness (Mičić et al., 2022). In modern organizations, the quality of the digital work environment is a crucial factor because it can influence how employees work, interact, and adapt to technological changes. A supportive digital work environment generally provides adequate technology access, more effective communication, and more flexible and efficient work processes (Mičić et al., 2022). Conversely, a less supportive digital work environment can increase workloads, cause psychological stress, and impact employee work experiences (Berger et al., 2024).

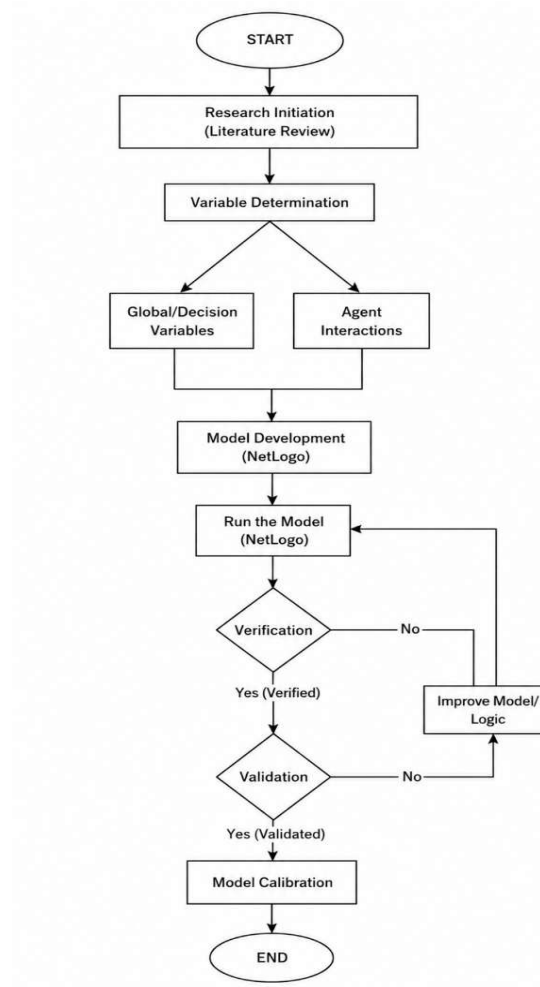
A digital workplace is a technology-based work system designed to support productivity, collaboration, communication, and knowledge management (Mičić & Mastilo, 2022). The digital work environment moderates the relationship between digital competence and employee agility, indicating that a supportive technology-based work environment can increase employee effectiveness and adaptability (Noerchoidah et al., 2026).

METHOD

The model developed in this study utilizes Agent-Based Modeling (ABM) to simulate the dynamics of turnover intention among employees working in a digital work environment. Agent-Based Modeling (ABM) is a computational modeling approach used to simulate systems consisting of multiple autonomous agents interacting within a specific environment (Crooks et al., 2021). In this model, each employee is represented as an agent with varying individual characteristics, levels of job satisfaction, and tendencies toward turnover intention. These agents interact with each other through the digital work environment, enabling the exchange of information, experiences, and work-related perceptions (Onggo & Foramitti, 2021).

Continuous interactions can generate social influences that drive changes in individual behavior, including increases or decreases in turnover intention. With this approach, the study explores how the combination of individual factors, digital work environment conditions, and coworker influence results in patterns of turnover intention distribution at the organizational level.

The overall workflow of the proposed Agent-Based Modeling (ABM) framework, including model development, agent interactions, verification, validation, and calibration, is illustrated in Figure 1.



Source: Author's compilation, 2026

Figure 1
Agent Based Model (ABM) Flowchart

This model uses several variables representing employee characteristics, digital work environment conditions, and social interactions between employees that influence changes in turnover intention. Each variable and parameter is determined based on previous research findings to ensure the model realistically represents the phenomenon of turnover intention distribution.

The variables and their corresponding descriptions used in the proposed agent-based model are summarized in Table 1.

Tabel 1
Model Variable

Scope	Variable	Description
Turtles-own	digital-work-stress	The level of work pressure felt by agents due to the use of digital technology and overconnectivity (0.0–1.0).
	job-engagement	Agents' level of engagement, enthusiasm, and energy toward their work (0.0–1.0).

	organizational-commitment	Agents' level of loyalty and emotional attachment to the organization (0.0–1.0).
	turnover-intention	Agents' level of tendency to leave the organization (0.0–1.0).
	interaction-intensity	Agents' level of social interaction intensity with coworkers (0.0–1.0). This variable represents the contagion effect mechanism, namely the spread of turnover intention through social interactions between agents.
	social-interaction-frequency	The number of neighbors an agent interacts with each tick.
Globals	avg-turnover-intention	Average turnover intention across agents per tick.
	pct-high-turnover	Percentage of agents with turnover intention >0.6 per tick. Indicates the proportion of employees at high risk of leaving the organization.
	pct-moderate-turnover	Percentage of agents with turnover intention 0.4–0.6 per tick. Indicates the proportion of employees in a vulnerable and potentially at-risk state.
	pct-low-turnover	Percentage of agents with turnover intention <0.4 per tick. Indicates the proportion of employees who are stable and safe from turnover risk.
	avg-digital-work-stress	Average digital work stress across agents per tick. Describes the collective stress caused by the digital work environment.
	avg-job-engagement	Average job engagement across agents per tick. Reflects the level of organizational work engagement.
	avg-organizational-commitment	Average organizational commitment across agents per tick. Reflects collective loyalty and the strength of organizational buffers.
	digital-work-environment-quality	Value of the quality of the active digital work environment in the simulation (0.0–1.0).
	diffusion-index	Index of the strength of the spread of turnover intention within the social network per tick.
	avg-social-interaction-frequency	Average frequency of social interactions between agents within the network per tick.

Source: Author's compilation, 2026

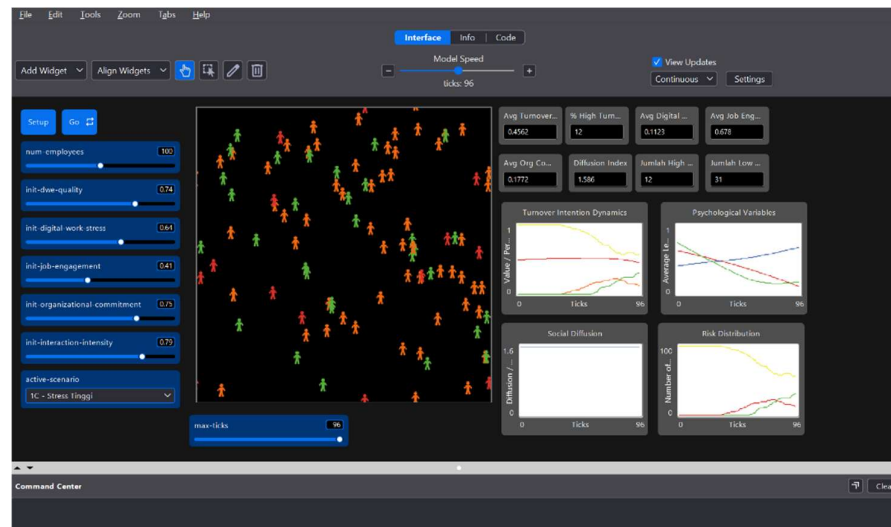
Overall, this variable model enables a comprehensive simulation in capturing the complex relationship between digital work stress, job engagement, organizational commitment, and employee turnover intention. Interactions between agents through social networks amplify the contagion effect, so that changes in one agent can gradually affect other agents. By dynamically updating variables at each tick, this model is able to represent the evolution of organizational behavior over time while providing a more realistic picture of how turnover intention is formed and spread in the modern digital work environment.

This simulation was run with Max Ticks = 96 ticks, with the provision that 1 tick is equivalent to 1 week, so that the entire simulation period covers 24 months or 2 years, in accordance with the agent-based modeling approach in employee turnover studies, which generally uses a medium- to long-term time horizon to capture the dynamics of behavioral change more comprehensively (Mastroianni & Storberg-Walker, 2014).

A simulation model interface was developed to illustrate the process of change and distribution of turnover intention among employees in a digital work environment. The model interface provides various components that allow users to set research parameters, run simulations, and visually observe agent behavior and simulation results. Through this interface, users can evaluate how interactions between employees and the

digital work environment influence the development of turnover intention within the organization.

The graphical user interface (GUI) of the proposed agent-based model is presented in Figure 2. The interface integrates parameter configuration, simulation controls, agent visualization, real-time monitoring, and graphical outputs to facilitate observation and analysis of turnover intention dynamics in the digital work environment.



Source: Author's compilation, 2026

Figure 2
Interface Model

The model interface consists of several main components: the Setup button, which establishes the initial simulation conditions by generating employee agents and their initial attributes, and the Go button, which runs the simulation so agents can interact and update their turnover intention levels. The visualization area displays agents representing employees in a digital work environment, each with digital attributes such as work stress, job engagement, organizational commitment, and turnover intention. Different colors are used to indicate each agent's turnover intention level: green for low, orange for medium, and red for high, allowing for easy observation of the dynamics of turnover intention distribution throughout the simulation.

Furthermore, a parameter panel is used to adjust various model variables, such as the number of employees, the quality of the digital work environment, the level of job engagement, the level of organizational commitment, the interaction radius, the strength of the contagion effect, and the simulation time limit (max-ticks). Simulation results are displayed through numeric indicators and dynamic graphs showing the average turnover intention, the percentage of employees with high turnover intention, and changes in these values throughout the simulation, facilitating analysis of distribution patterns and influencing factors.

The verification process was conducted to ensure that the Agent-Based Modeling (ABM) model was correctly implemented on the simulation platform (Crooks et al., 2021). Testing included the agent attribute change mechanism, the interaction process between employees, and the calculation of turnover intention at each simulation tick.

Verification was also conducted by running various parameter combinations, such as digital work stress, job engagement, organizational commitment, employee interaction intensity, and the digital work environment. The test results showed that all designed rules operated according to the model's logic and produced consistent output throughout the simulation.

Model validation was conducted using face validation and pattern validation approaches (Grimm et al., 2005; Klügl, 2008). In the face validation stage the behavior of agents and the emerging patterns generated by the simulation model were evaluated to assess whether they were plausible and consistent with the conceptual understanding of the real-world system (Klügl, 2008). The validation process was conducted by examining whether the simulated relationships among digital work stress, job engagement, organizational commitment, and turnover intention aligned with the theoretical assumptions and previous empirical findings. Meanwhile, pattern validation was conducted by comparing the patterns generated by the simulation with the theoretical expectations and findings reported in previous studies (Grimm et al., 2005). In general, the simulation showed that increasing digital work stress tended to increase turnover intention, while increasing job engagement and organizational commitment could decrease this tendency. Furthermore, interactions among employees demonstrated a contagion effect, and the resulting diffusion pattern was consistent with the theoretical assumptions incorporated into the model.

RESULTS AND DISCUSSION

Simulation Scenario 1 – Digital Work Stress Dominant

The first simulation scenario was designed to answer the second research question, namely, "How do digital work stress, job engagement, and organizational commitment influence turnover intention?" Through three sub-scenarios with varying levels of digital work stress and the quality of the digital work environment, this scenario tested the extent to which digital work stress, along with other psychological factors, shapes and influences the dynamics of turnover intention in a digital work environment.

The configuration of the three sub-scenarios, including their objectives, simulation parameters, and expected interpretations, is summarized in Table 2.

Table 2
Simulation Scenario 1

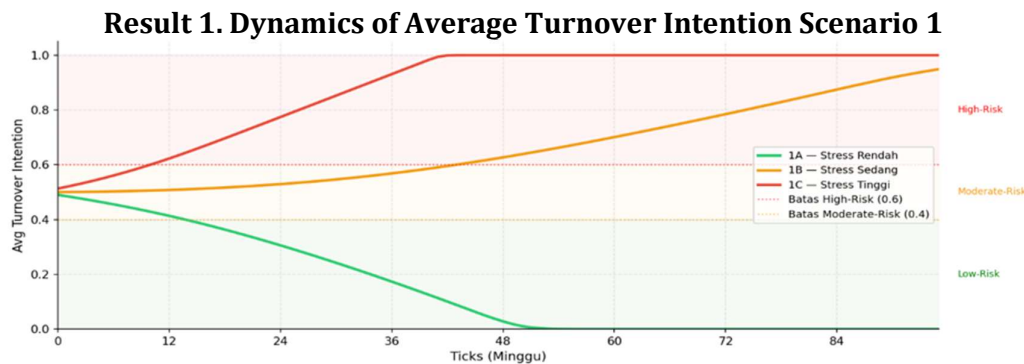
Scenario	Phenomenon	Reference	Parameters Interpretation
Scenario 1. Digital Work Stress Dominant – stress driven turnover			
1A. Low Stress – Stable Work Environment.	Examines how low levels of digital work stress in a supportive digital work environment can suppress the spread of turnover intention among employees turnover intention.	ticks = 96 num-employees = 100 init-digital-work-stress = 0.3 init-job-engagement = 0.7 init-organizational-commitment = 0.7 init-interaction-intensity = 0.4 init-dwe-quality = 0.8.	This scenario demonstrates that the combination of low stress, high engagement, and a positive digital environment consistently suppresses turnover intention. The majority of agents are projected to remain in the low-risk category until the end of the simulation (tick 96), reflecting a healthy and stable digital work environment.

1B. Moderate Stress – Initial Imbalance	Examines how moderate work stress conditions in a neutral digital environment influence the dynamics of increasing turnover intention through social interactions.	ticks = 96 num-employees = 100 init-digital-work-stress = 0.5 init-job-engagement = 0.5 init-organizational-commitment = 0.5 init-interaction-intensity = 0.6 init-dwe-quality = 0.5	This scenario demonstrates a gradual transition from moderate-risk to high-risk. The initial imbalance is insufficient to withstand the increase in stress over time, resulting in progressive turnover intention increases, with most agents entering the high-risk category in the second half of the simulation.
1C. High Stress – Unsupportive Environment	See how high digital work stress in a negative digital work environment triggers an accelerated spread of turnover intention among employees.	ticks = 96 num-employees = 100 init-digital-work-stress = 0.8 init-job-engagement = 0.3 init-organizational-commitment = 0.3 init-interaction-intensity = 0.7 init-dwe-quality = 0.2	This scenario demonstrates a rapid escalation towards high-risk employee dominance. High stress combined with low engagement and commitment, and an unsupportive digital environment, results in a drastic and unstoppable increase in turnover intention from the start of the simulation.

Source: Author's compilation, 2026

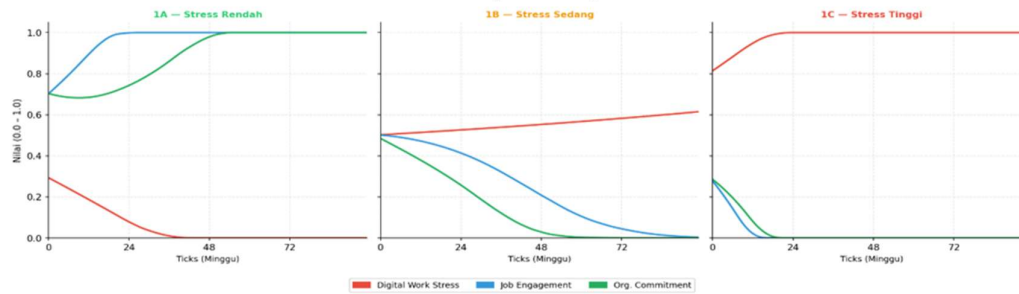
The three sub-scenarios in Scenario 1 differentiate digital work stress conditions in stages, namely low (1A: 0.3), medium (1B: 0.5), and high (1C: 0.8), with the quality of the digital work environment (dwe-quality) adjusted proportionally (0.8, 0.5, and 0.2). The job engagement and organizational commitment parameters in 1C are set low (0.3 each) to reflect a weakened psychological condition, while interaction intensity increases with high stress (0.4, 0.6, 0.7) to capture the effects of more intensive social contagion in stressful work conditions.

The simulation results for Scenario 1 are presented through two complementary visualizations. Figure 3 illustrates the dynamics of the average turnover intention throughout the simulation period, whereas Figure 4 presents the distribution of the psychological variables, including digital work stress, job engagement, and organizational commitment, across the three sub-scenarios.



Source: Author's compilation, 2026

Figure 3
Graph of the Dynamic Results of Average Turnover Intention Scenario 1

Result 2. Distribution of Psychological Variables in Scenario 1

Source: Author's compilation, 2026

Figure 4
Graph of Psychological Variable Distribution Results for Scenario 1

Based on Result 1, the three sub-scenarios produced three significantly different trajectories of turnover intention change. Sub-scenario 1A, with low stress (0.3) and a supportive digital environment ($dwe=0.8$), showed a consistent downward trend from 0.49 to 0.00 at the end of the simulation, reaching a full low-risk state around tick 50. Conversely, sub-scenario 1C, with high stress (0.8) and an unsupportive environment ($dwe = 0.2$), experienced the fastest escalation, breaking through the high-risk threshold (0.6) at tick 12 and reaching a saturation point of 1.0 at tick 42. Sub-scenario 1B fell between the two, showing a gradual increase from 0.50 to 0.95 without ever reaching a plateau until the end of the simulation.

Result 2 confirmed this pattern through the dynamics of psychological variables. In 1A, digital work stress decreased from 0.29 to 0.00, while job engagement and organizational commitment increased toward 1.0, illustrating a mutually reinforcing cycle of psychological recovery. This situation suggests that when stress is low and the digital environment is supportive, all three variables move synergistically toward a healthy psychological state. In Scenario 1C, stress rapidly spikes to 1.0 in less than 24 ticks, followed by a collapse in engagement and commitment to 0 within the same period—this almost immediate psychological collapse explains why turnover intention in Scenario 1C escalates much more rapidly than in the other sub-scenarios.

Overall, the results of Scenario 1 answer the second research question by demonstrating that digital work stress acts as a dominant driver directly influencing turnover intention. The higher the digital work stress and the lower the quality of the digital environment, the faster the decline in job engagement and organizational commitment, and the higher the resulting turnover intention. These findings confirm that these three psychological variables operate interconnectedly in shaping the dynamics of turnover intention in a digital work environment.

Simulation Scenario 2 – Social Diffusion & Peer Influence

The second simulation scenario was designed to answer the first research question, namely, "How does turnover intention spread through social interactions in a digital work environment?" By establishing identical initial psychological conditions across the three sub-scenarios and varying only the intensity of social interactions, this scenario isolatedly tested the role of social networks as a channel for the spread of turnover intention. The configuration of the three sub-scenarios, including their objectives, simulation parameters, and expected interpretations, is summarized in Table 3.

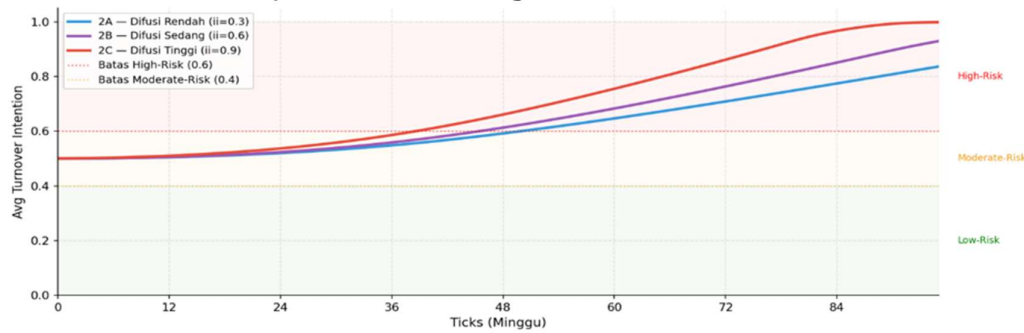
Table 3
Simulation Scenario 2

Scenario	Phenomenon	Reference	Parameters Interpretation
Scenario 2. Social Diffusion & Peer Influence — contagion effect			
2A. Low interaction – weak diffusion	Examines how limited interaction between employees in social networks affects the speed of turnover intention spread in a digital work environment.	ticks = 96 num-employees = 100 init-digital-work-stress = 0.5 init-job-engagement = 0.5 init-organizational-commitment = 0.5 init-interaction-intensity = 0.3 init-dwe-quality = 0.5	This scenario shows that limited social interaction slows the spread of turnover intention significantly. A low diffusion index results in a slow spread pattern, with agents moving to high-risk more slowly than in sub-scenarios 2B and 2C, demonstrating the role of social networks as a spread channel.
2B. Moderate Interaction – Normal Diffusion	Examines how moderate intensity of social interaction affects the speed and pattern of turnover intention spread in digital networks.	Ticks = 96 Num-Employees = 100 Init-Digital-Work-Stress = 0.5 Init-Job-Engagement = 0.5 Init-Organizational-Commitment = 0.5 Init-Interaction-Intensity = 0.6 Init-Dwe-Quality = 0.5.	This scenario demonstrates a balance between individual and social influences in shaping turnover intention patterns. The spread is faster than in 2A but more controlled than in 2C, illustrating the dynamics of a contagion effect proportional to the intensity of interaction.
2C. High Interaction – Strong Diffusion	Examines how very high levels of social interaction accelerate the spread of turnover intention through social contagion mechanisms in a digital work environment.	ticks = 96 num-employees = 100 init-digital-work-stress = 0.5 init-job-engagement = 0.5 init-organizational-commitment = 0.5 init-interaction-intensity = 0.9 init-dwe-quality = 0.5	This scenario shows that very intense interactions significantly accelerate the clustering of high-risk employees compared to 2A and 2B. A high diffusion index causes turnover intention to spread more rapidly through the social network, confirming the role of strong social contagion in amplifying turnover risk.

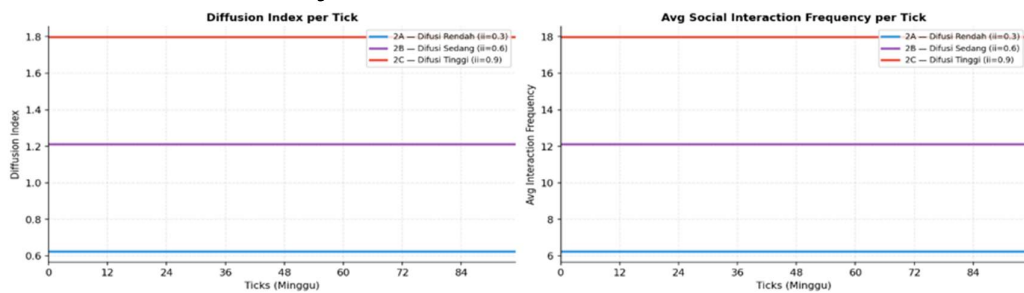
Source: Author's compilation, 2026

Unlike Scenario 1, all sub-scenarios in Scenario 2 use identical initial values for digital work stress (0.5), job engagement (0.5), organizational commitment (0.5), and relationship quality (0.5). The only parameter varied is the initial interaction intensity, which is 0.3 in 2A (low diffusion), 0.6 in 2B (medium diffusion), and 0.9 in 2C (high diffusion). This design ensures that differences in results across sub-scenarios solely reflect the effect of social interaction intensity on the speed and strength of turnover intention spread.

The simulation results for Scenario 2 are presented through two complementary visualizations. Figure 5 illustrates the dynamics of the average turnover intention across the three sub-scenarios, whereas Figure 6 presents the dynamics of the Social Diffusion Index, highlighting the spread of turnover intention through employee interactions over the simulation period.

Result 1. Dynamics of Average Turnover Intention Scenario 2

Source: Author's compilation, 2026

Figure 5**Graph of the Dynamic Results of Average Turnover Intention Scenario 2****Result 2. Dynamics of Social Diffusion Index Scenario 2**

Source: Author's compilation, 2026

Figure 6**Graph of the Dynamic Result of Social Diffusion Index Scenario 2**

Result 1 shows that although the three sub-scenarios have identical starting points (TI = 0.50), the trajectories of turnover intention change differ significantly as the simulation progresses. Sub-scenario 2C, with high interaction (0.9), reaches the highest TI (0.999) at the end of the simulation, followed by 2B, with moderate interaction (0.6), at 0.93, and 2A, with low interaction (0.3), at only 0.84—the only sub-scenario that has not yet reached full saturation at tick 95. These differences in trajectories begin to become significant after tick 36, indicating a latent period before the social contagion effect is fully manifested collectively.

Result 2 provides a mechanistic explanation for these differences. The diffusion index and average frequency of social interactions remain constant throughout the simulation and are directly proportional to the set interaction intensity. Sub-scenario 2C recorded the highest diffusion index (1.8) with an interaction frequency of 18, almost three times that of 2A (0.6; frequency 6). This difference in diffusion index values directly determines how quickly and strongly turnover intention spreads through social networks among employees.

The findings from Scenario 2 answer the first research question by demonstrating that turnover intention spreads through social interaction networks in the digital work

environment through the contagion effect mechanism. The intensity of social interaction acts as a diffusion accelerator: the higher the interaction intensity, the greater the diffusion index, and the faster turnover intention spreads from one employee to another. It is important to emphasize that social interaction is not the initial trigger for turnover intention, but rather the mechanism that accelerates and expands its spread within the population.

Simulation Scenario 3 – Organizational Commitment Buffer

The third simulation scenario was designed to answer the third research question, namely "How does the contagion effect produce collective behavior (emergent behavior) in organizations?" This scenario focuses on testing the role of organizational commitment as a protective factor (buffer) that determines the direction and pattern of collective turnover intention that arises from interactions between employees in the system. The configuration of the three sub-scenarios, including their objectives, simulation parameters, and expected interpretations, is summarized in Table 4.

Table 4
Simulation Scenario 3

Scenario	Phenomenon	Reference	Parameters Interpretation
Scenario 3. Organizational Commitment Buffer — turnover protection			
3A. High Commitment – Strong Protection	Examine how high organizational commitment can buffer increased turnover intention despite the stress and social interaction pressures of a digital work environment	ticks = 96 num-employees = 100 init-digital-work-stress = 0.5 init-job-engagement = 0.6 init-organizational-commitment = 0.8 init-interaction-intensity = 0.6 init-dwe-quality = 0.6	This scenario demonstrates that high organizational commitment serves as an effective buffer. Despite moderate stress, turnover intention gradually decreases, and the majority of agents move toward or remain in the low-risk category, demonstrating the protective role of commitment against employee turnover intentions.
3B. Moderate Commitment – Balanced Dynamics	Examines how a moderate level of organizational commitment affects the balance between stress, engagement, and turnover intention in a digital work network.	Ticks = 96 Num-Employees = 100 Init-Digital-Work-Stress = 0.5 Init-Job-Engagement = 0.5 Init-Organizational-Commitment = 0.5 Init-Interaction-Intensity = 0.6 Init-Dwe-Quality = 0.5.	This scenario demonstrates a situation where moderate commitment is not strong enough to withstand the stressful pressures of the digital environment, resulting in a progressive increase in turnover intention. Compared to 3A, the absence of a strong commitment buffer demonstrates the importance of organizational

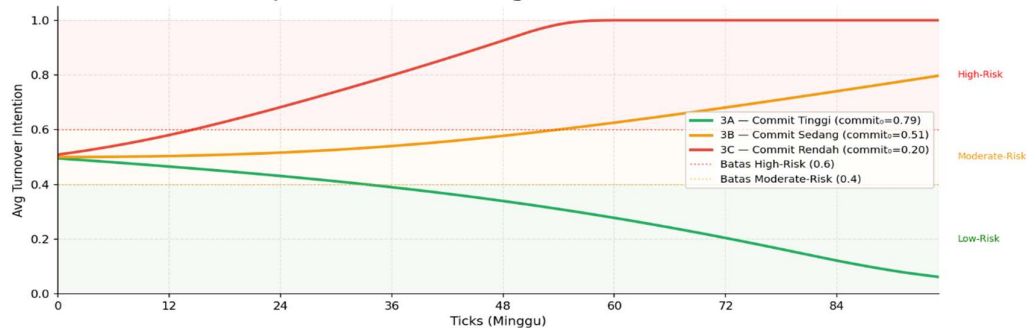
3C. Low Commitment – High Turnover Risk	Examine how low organizational commitment accelerates increased turnover intention under conditions of high stress and intense social interaction.	ticks = 96 num-employees = 100 init-digital-work-stress = 0.6 init-job-engagement = 0.3 init-organizational-commitment = 0.2 init-interaction-intensity = 0.7 init-dwe-quality = 0.4.	commitment as a protective barrier. This scenario demonstrates that low commitment simultaneously amplifies the effects of stress and social contagion, resulting in the dominance of high-risk employees from the beginning of the simulation. The absence of an organizational commitment buffer makes agents highly vulnerable to negative social influences and digital environmental pressures.
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Source: Author's compilation, 2026

Scenario 3 varies initial organizational commitment in stages: high (3A: 0.8), medium (3B: 0.5), and low (3C: 0.2), with digital environment quality (dwe-quality) also adjusted (0.6, 0.55, and 0.4). In 3A, job engagement is set slightly higher (0.6) to reflect a more conducive psychological condition, while in 3C, digital work stress is raised to 0.6 and job engagement is lowered to 0.3 to reflect conditions susceptible to escalating turnover intention.

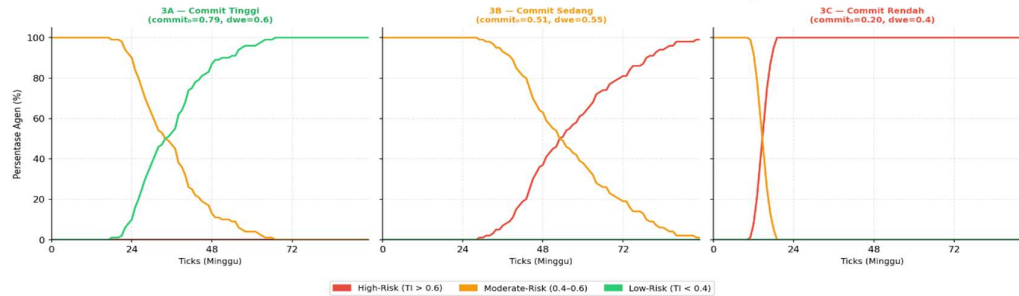
The simulation results for Scenario 3 are presented through two complementary visualizations. Figure 7 illustrates the dynamics of the average turnover intention across the three sub-scenarios, whereas Figure 8 presents the distribution of turnover intention risk categories, showing the proportion of employees classified as low-, moderate-, and high-risk throughout the simulation period.

Result 1. Dynamics of Average Turnover Intention Scenario 3



Source: Author's compilation, 2026

Figure 7
Graph of the Dynamic Results of Average Turnover Intention Scenario 3

Result 2. Distribution of Turnover Intention Risk Categories Scenario 3

Source: Author's compilation, 2026

Figure 8
Graph of Turnover Intention Risk Category Distribution Results for Scenario 3

Result 1 reveals the most contrasting pattern among all the scenarios in this study. Sub-scenario 3A, with high commitment (0.79), showed a consistent downward trend in turnover intention from 0.50 to 0.06 by the end of the simulation—the only sub-scenario in the entire study that successfully reversed the overall TI trend. Conversely, 3C, with low commitment (0.20), experienced the fastest escalation, breaking through the high-risk threshold at tick 12 and reaching saturation at 1.0 at tick 56. Sub-scenario 3B fell between the two, showing a gradual increase in TI to 0.80 without strong enough commitment to halt the trend.

Result 2 shows distinct emergent behavior in each sub-scenario, in the form of the distribution of collective risk categories. In 3A, there was an increasingly massive population shift toward the low-risk category—reaching 100% at tick 68—which was the first and only full recovery pattern in the entire series of simulations in this study. This pattern represents positive emergent behavior arising from interactions between agents under conditions of high commitment: when some agents successfully maintain low TI, this positive influence spreads through the social network and attracts other agents to also reduce their TI. Conversely, in 3C, negative emergent behavior occurs in the form of a massive collapse to the high-risk category that occurs almost immediately (ticks 10–18), indicating that the absence of a commitment buffer creates conditions where negative contagion effects dominate the system quickly and uncontrollably.

Overall, Scenario 3 answers the third research question by demonstrating that contagion effects can produce emergent behaviors that differ in direction depending on the level of organizational commitment within the system. When commitment is high, the emergent behaviors are collective recovery and organizational stability. When commitment is low, the emergent behaviors are massive, uncontrollable escalations. These findings confirm that organizational commitment is not simply an individual psychological variable but a determinant of the overall system's direction, influencing whether contagion effects act as a restorative or destructive force within an organization.

CONCLUSION AND SUGGESTION

This study developed an Agent-Based Modeling (ABM) model to illustrate the spread of turnover intention through interactions between employees in a digital work environment. Simulation results show that turnover intention is not only influenced by individual psychological states but also develops as a consequence of social interactions within the organization.

In the first scenario, increasing digital work stress is consistently followed by an increase in turnover intention, while job engagement and organizational commitment contribute to suppressing this tendency. These results indicate that employee psychological states play a significant role in shaping changes in turnover intention. Meanwhile, the second scenario shows that the intensity of social interactions influences the speed of turnover intention spread. The higher the intensity of interactions between employees, the faster the tendency spreads through the contagion effect mechanism. In the third scenario, organizational commitment is proven to be a factor capable of maintaining system stability. High levels of commitment encourage a decrease in turnover intention, while low levels of commitment make the system more vulnerable to increased turnover risk.

Overall, the results show that the dynamics of turnover intention are the result of the interrelationships between digital work stress, job engagement, organizational commitment, and social interactions between employees. The ABM approach provides insight into how changes at the individual level can develop into collective patterns at the organizational level. Thus, the developed model not only provides an understanding of the process of turnover intention distribution but can also be used as a basis for evaluating various employee retention strategies in an increasingly digitalized work environment.

Further research is recommended to use empirical organizational data to calibrate the model parameters so that simulation results can more accurately represent real-world conditions. Furthermore, the addition of variables such as leadership, job satisfaction, organizational culture, and other external factors is expected to enrich the model's ability to explain the dynamics of turnover intention.

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