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Investigating the Effect of Organizational Citizenship Behavior on Employee Performance Using the System Dynamics Approach (Case Study: Yasuj Municipality)

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ABSTRACT

As one of the emerging research fields of sustainability management, Organizational Citizenship Behavior (OCB), especially its influence on employee performance, has drawn increased attention in the academic and industrial areas. Nevertheless, existing studies mainly examine the static relationship between OCB and employee performance. Therefore, this paper aims to evaluate the dynamic impacts of OCB on employee performance in Yasuj Municipality with the assistance of a system dynamics model. Four causal feedback loops and a stock-flow diagram were developed to illustrate the dynamic influencing mechanism. Three distinct policies quantitatively simulated the possible impacts of OCB changes on the whole system and, specifically, on employee performance. The results show that increasing the Actual Increasing Rate of Project Culture (AIROC) significantly influences OCB and employee performance improvement. The higher the AIRPP (actual increasing rate of potential promotion) in the multi-policy scenario, the higher the OCB and the performance. One major contribution is that this study is one of the first to explore the potential use of system dynamics to model organizational behavior and its performance, which has implications for the practical and cultural promotion of OCB.

Keywords

Keywords: Organizational citizenship behavior, Employees performance, System dynamics approach, Simulation.

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1. Introduction

The swift expansion of technology, widespread availability of information, dissolution of geographical barriers to knowledge, the phenomenon of globalization, the proliferation of industrial and commercial organizations to address crises, hardships, and threats, as well as their survival and longevity in this fiercely competitive world, unequivocally demonstrate the necessity of learning. While advanced technology, adequate space, current equipment, and material and financial capital are important factors for advancement and success, they alone are not enough (Karimi and Akbari, 2014). Today, the crucial role of human resources in enterprises is imperative due to the dynamic economic landscape and the significance of innovation in services. In the current highly competitive business environment, organizations focus on ensuring survival, growth, and overall success. To achieve this crucial objective, the managers seek to identify and efficiently utilize resources and capital, which involves significant expenses and efforts. Therefore, the managers who apply the indicated funds in the most optimal, proficient, and fruitful manner emerge as the victors in this domain. The primary assets of any business consist of human, financial, and technical resources, which decisively shape the trajectory of other forms of capital. This is because the workforce leverages its skills and strategic thinking to acquire and utilize other resources (Hodson, 2006).

An exemplary organizational citizen is an idea and thought that encompasses a range of employee behaviors, including willingly taking on extra duties and responsibilities, adhering to the organization's rules and procedures, cultivating a positive attitude, and demonstrating patience and tolerance towards workplace challenges and dissatisfaction. Organizational theories suggest that organizational citizenship behavior significantly contributes to the competitiveness and performance of an organization. Furthermore, the inclination and readiness to behave as a responsible member of the organization are becoming increasingly important in light of the growing global competition and the need for innovation, adaptability, productivity, and responsiveness to external circumstances (Tehrani et al., 2018).

Organizational citizenship behavior is particularly crucial for organizations or business units insofar as it enhances organizational performance and sustains their competitive advantage in the market (Chang et al., 2021; Han et al., 2019; Singh and Singh, 2019; Özkan et al., 2021; Qiu and Dooley, 2022). The goal of organizational citizenship behavior is often set to help organizations and firms develop higher-quality performance, improve customer satisfaction and create better social interactions between employees, reduce risk, and increase efficiency, as well

as to maintain these improvement results under a sense of community among employees (Abdullahi et al., 2020; Khalfan et al., 2022; Kowal et al., 2019; Sarfraz et al., 2022).

Nemati et al. (2016) examined the impact of social capital, commitment, and organizational citizenship behavior on work performance. The study focused on the Khoy City Municipality as a case study. The research findings demonstrated that social capital had a beneficial impact on employee commitment, organizational citizenship behavior, and work effectiveness. Furthermore, the study also demonstrated the beneficial impact of employees' dedication and the manifestation of organizational citizenship behaviors on job performance. Therefore, enhancing the procedures associated with employee dedication and organizational citizenship behaviors, which are impacted by factors like social capital, results in the enhancement of employees' job performance.

Shiravand (2014) examined the impact of organizational citizenship behavior and its many aspects on the satisfaction level of customers in the 17th district of Tehran municipality. The findings suggest a noteworthy correlation between organizational citizenship behavior and employer satisfaction. The regression model confirmed a strong correlation between social etiquette, altruism, conscientiousness, mutual personal coordination, protection of the organization's resources, chivalry, and politeness in predicting customer satisfaction. The order of importance, based on the regression model, is conscientiousness, altruism, social etiquette, protection of the organization's resources, mutual personal harmony, and chivalry.

Wang et al. (2018) conducted a research work with the aim of accessing the dynamic impacts of OCB on the organizational performance of mega-projects, utilizing a dynamic system model. The dynamic influence mechanism was illustrated by developing four causal feedback loops and a stock and flow diagram. Additionally, three distinct policies were employed to numerically predict the potential consequences of changes in OCB on the entire system.

Demonstrating human resource citizenship behaviors in service organizations is crucial due to the pivotal role of employees who directly interact with customers, as they are the driving force behind the organization. Services, in contrast to products, are both generated and consumed simultaneously. Service workers can function as service producers. The importance of service personnel in offering high-quality services has received significant attention (Binstock et al., 2003). A municipality is a non-governmental public agency that offers its citizens a wide range of public services. Employees play a crucial role in municipalities as service organizations. Consequently, the employees’ voluntary and optional activities, known as organizational citizenship behavior, can greatly influence people's opinion of service quality.

Employees' job performance significantly impacts the overall success of organizations, including the municipality (Mirsepasi et al., 2011).

Although existing studies have demonstrated that OCB positively contributes to employee performance (Braun et al., 2013), two problems are still found in previous studies. Firstly, most existing papers have studied the relationship between OCB and employee performance from a static and isolated perspective without systematically considering the interrelationships among different influencing factors. Secondly, the existing studies have mainly concentrated on qualitative analyses based on surveys, failing to quantify the impact of OCB on employee performance.

Therefore, this study aims to assess the impacts of the OCB on employee performance inside the Yasouj city municipality with the aid of the System Dynamics (SD) approach. The reasons for adopting an SD approach are mainly two-fold. Firstly, since there are numbers of elements within the OCB system and their relationships tend to change and are complicated, the SD approach is demonstrated as a well-established method for studying and managing such complex feedback systems (Wang et al., 2018), and facilitating better understanding on the mutual relationships between the behavior of a system. Secondly, elements in the OCB system are largely interdependent (Nielsen et al., 2009). SD modeling can discover and illustrate interrelationships among elements and facilitate the measurement of dynamics among elements (Coyle, 1996). In addition, the SD approach is also effective in evaluating the consequences of new policies and structures (Sterman, 2002). Taking the aspects above, the SD approach is considered a suitable method for fulfilling this study's research aims. The proposed model is also expected to help decision-makers better understand how OCB affects employee performance.

The rest of this paper is organized as follows: Section 2 entails the literature review, including an explanation of the concept, dimensions, and driving factors of OCBs. Section 3 introduces SD modeling with a detailed process of model development. Section 4 is the policy analysis, discussing a base run and three policy scenarios (two single-policy scenarios and one multi-policy scenario). Section 5 concludes the study.

2. Literature review

OCB was first put forward in the 1980s and defined as "individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and that, in the aggregate, promotes the effective functioning of the organization" (Organ, 1988). Afterward,

OCB attracted the interest of many scholars, and many studies were conducted on it. However, there is rather limited literature on OCB in the context of megaprojects. Similar to the definition of OCB in organizational areas, OCB in the megaprojects field can be defined as the positive behaviors of participants that are not recognized by formal contracts or requirements but would lead to the effective achievement of the project goals (Yang et al., 2018). For example, in the South-to-North Water Transfer project, the local government held a labor contest (a typical practice in China to motivate and improve OCB engagement in the project implementation), and all participants in this megaproject were involved. Participants voluntarily competed in safety, quality, schedule, innovations, environmental protections, and so on (Yang et al., 2018). Participants could only win by exceeding the typical requirements and achieving high performance. Meanwhile, winners were only awarded medals, trophies, and so forth without compensation (Tang et al., 2013). Currently, existing studies have already demonstrated that OCB plays an important role in improving management effectiveness, organizational efficiency, labor productivity, and so forth, eventually benefiting the megaproject on the whole (Patanakul et al., 2016).

Although OCBs have been observed in many megaprojects, studies in the context of megaprojects are still limited, especially on the dimensions and driving factors. One of the most presentative studies on the dimensions of OCB is the seven-dimensional model established by Podsakoff (Podsakoff et al., 2000), which includes helping behavior, sportsmanship, organizational loyalty, organizational compliance, individual initiative, civic virtue, and self-development. However, the research conducted by Podsakoff mentioned above was conducted in permanent organizations, which are, in fact, different from temporary organizations like project-based organizations (Nielsen et al., 2009). (Braun et al., 2013). Thus, megaproject OCBs would have unique dimensions and motivations (Braun et al., 2013). pointed out that no matter the project compliance or individual compliance, its essence is to obey the organization's regulations and related rules, and the difference between the two kinds of behavior is only the subject on which they should be compliant. The nature of organizational loyalty and sportsmanship behavior is initially individual staff dedicated to their work, namely adhering to the high self-demand, having the initiative to work overtime, and working in extreme conditions voluntarily without any supervision; hence, the two behaviors can be summarized as conscientiousness (Farh et al., 2004). Civic virtue refers to good interpersonal relationships in organizations, and the core is the maintenance of harmonious relationships (Braun et al., 2013). Self-development and individual initiative mean work completed creatively or spontaneously

improving work skills (George and Jones, 1997). Thus, these two behaviors can be interpreted as innovation in the megaproject context. Helping behavior means providing direct help to others and taking the initiative to work with colleagues (Podsakoff et al., 2014). While in megaprojects, He et al. (2015) believed this behavior should be interpreted as collaboration behavior. Therefore, project compliance behavior, innovation behavior, collaboration behavior, conscientiousness, and harmonious relationship maintenance behavior are summarized as the five dimensions of OCB in this study.

In addition, the driving factors are another sub-topic to be researched in the OCB field, and employee characteristics, task characteristics, leadership behaviors, and organizational characteristics are the most important driving factors for conducting OCB (Podsakoff et al., 2000). However, in megaprojects, participants act on actions on behalf of the enterprises they belong to; thus, their behavioral motivations are more likely to be significant in sociality and the pursuit of long-term interests (Li and Liang, 2015). Meanwhile, megaprojects are normally launched and sponsored by governments; that is, participants are mostly state-owned enterprises or other successful enterprises cooperating with the government, especially in mainland China (He et al., 2015). Hence, enterprises are likely to achieve their political appeal by participating in the construction of megaprojects. To be specific, executives of state-owned enterprises are more likely to be promoted due to their good performance in megaprojects (Wang et al., 2018).

Moreover, aside from internal factors like the potential promotion mentioned above, the external environment drives OCB. Practically, the external environment has an important impact on participants' behavior, such as regulations, project culture, corporate reputation, and so forth (Cao and Wang, 2014). Therefore, as summarized above, the driving factors considered in this study include project culture, potential promotion, corporate reputation, and public satisfaction.

3. Model development

3.1. Steps of model development

SD, established by Forest in 1958 and designed based on systems thinking, has been widely used in various disciplines. Over the past two decades, it has been used to address economic, environmental, societal, agricultural, and other systems of great complexity. This method is particularly widely applied to the disciplines of construction activities, such as political decision-making systems (Yuan and Wang, 2014). Generally, an SD model can be visualized by a causal loop or stock-flow diagram. A causal loop diagram is continuously developed as a

conceptual model of systems to be studied. In contrast, a stock-flow diagram is established based on a causal loop diagram and computer simulation.

This paper primarily uses a five-step procedure to construct the model (Figure 1). Firstly, the boundary of the system and variables that can significantly influence the system's behavior should be identified. Based on that, a causal-loop diagram can be established to describe the system simply. Afterwards, a stock-flow diagram will be developed according to the causal-loop diagram. Furthermore, model validation should start testing the established model's confidence and robustness. Finally, policy analysis, consisting mainly of a base run simulation and three policy scenarios, would be conducted to simulate and analyze the impacts of the devised management policies after the model validation.

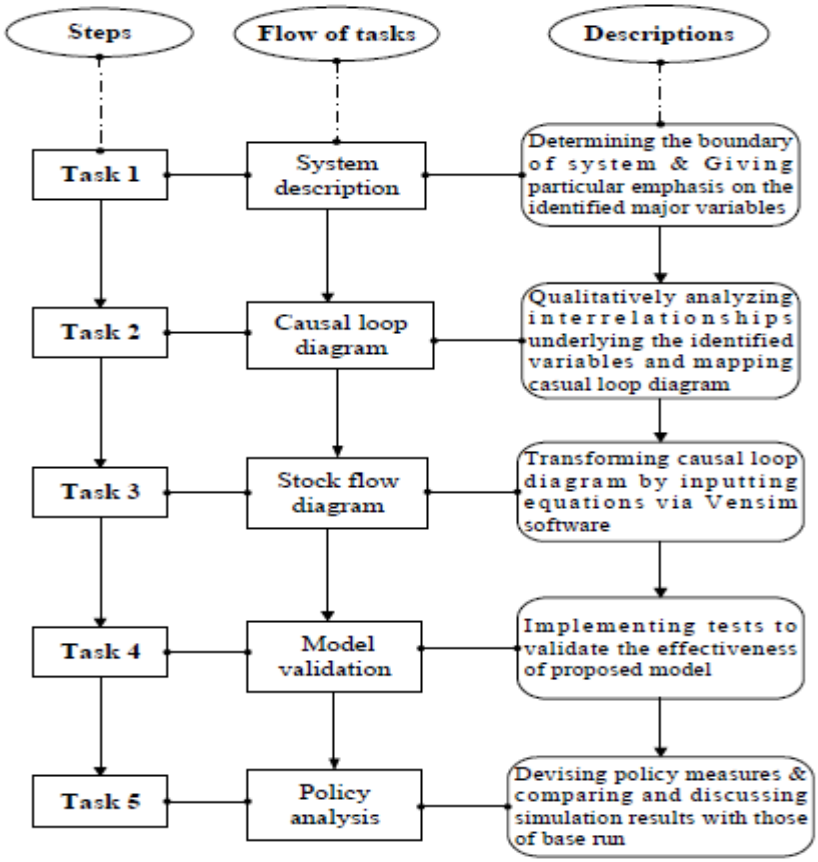

Figure 1. The research path for model development

3.2. The problem of dynamics

It is one of the most important parameters in evaluating the performance of OCB. In this research, OCB is the only factor affecting employees' performance. Other factors are beyond the scope of this research. Yasouj municipality has made many efforts to promote OCB, but OCB has had an upward trend from 2017 to 2022. Moreover, all indicators affecting this parameter (job satisfaction, organizational culture, employee opportunities for promotion) had

an upward trend with a very low slope. It seems that by increasing the growth rate of employee opportunities for promotion, the growth rate of organizational culture, and the promotion of other criteria that influence the promotion of OCB and finally improving the performance of employees, a better position of improvement can be reached. Therefore, investigating OCB is very necessary so that by using the research results, necessary measures can be taken to improve OCB and move towards more conscious planning to enhance the performance of employees.

3.3. Time domain and system boundary

This model's time horizon, which is intended for simulation, is 11 years, starting in 2017 and ending in 2027. Its geographical border is Yasouj Municipality..

3.4. Key pattern variables

According to the subject literature, the background of the research, and a survey of academic experts and specialists, the influential factors and components of OCB were identified in this research. The components of OCB include conscientiousness behavior, organizational adaptive behavior, collaborative behavior, innovative behavior, and harmonious relationship maintenance behavior. Its influential factors mainly included organizational culture, reputation, employee empowerment, and job satisfaction. These variables define the boundary of the model. Moreover, in this model, OCB is the only variable that affects performance. The variables examined in this model are specified in Table 1.

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Table 1. The descriptions of the variables used in the model

Acronym	Descriptions	Variable Type	Unit of measurement	Acronym	Descriptions	Variable Type	Unit of measurement
AIROC	Actual increasing rate of organizational culture	Constant	Percent	CRIHRM	changes rate index of harmonious relationship maintenance	Auxiliary	Percent
AIRPP	Actual increasing rate of potential promotion	Constant	Percent	CRIIB	changes rate index of innovation behavior	Auxiliary	Percent
AIRPS	Actual increasing rate of public satisfaction	Constant	Percent	CRIOC	changes rate index of organizational compliance	Auxiliary	Percent
AROCB	Adoption rate of organizational citizenship behavior	Auxiliary	Percent	CRIEP	changes rate index of employees performance	Auxiliary	Percent
ATAI	Advanced technology adopted initiatively	Constant	Percent	IEP	changes rate index of employees performance	Auxiliary	Percent
AVC	Accumulated value of conscientiousness	Stock	Percent	OCBA	Organizational citizenship behavior adoption	Auxiliary	Percent
AVCB	Accumulated value of collaboration behavior	Stock	Percent	OCI	Organizational culture increment	Flow	Percent
AVHRM	Accumulated value of harmonious relationship maintenance	Stock	Percent	PCI-1	Personal compliance increment	Flow	Percent
AVIB	Accumulated value of innovation behavior	Stock	Percent	EP	The Employee performance	Flow	Percent
AVOC	Accumulated value of organizational compliance	Stock	Percent	EPI	employees performance increment	Stock	Percent
AVPC-1	Accumulated value of organizational culture	Stock	Percent	PPII	Project program improved initiatively	Constant	Percent
AVPP	Accumulated value of potential promotion	Stock	Percent	PPMAC	Conscious participation in project meetings and activities	Constant	Percent
AVPS	Accumulated value of public satisfaction	Stock	Percent	PPOI	Potential promotion opportunities increment	Flow	Percent
BCP	Benefits of corporate reputation	Auxiliary	Percent	PSI	Public satisfaction increment	Flow	Percent
CBI	Collaboration behavior increment	Flow	Percent	PTC	Participation in training consciously	Constant	Percent
CCA	Coordination conflicts actively	Constant	Percent	SPE	Shares with project experience	Constant	Percent
CGR	Compliance with governmental requirements on the organization	Constant	Percent	TVOCB	Total value of organizational citizenship behavior	Auxiliary	Percent
CI	Conscientiousness increment	Flow	Percent	VC	Value of conscientiousness	Auxiliary	Percent
CMRC	Conduct mission requirements consciously	Constant	Percent	VCB	Value of collaboration behavior	Auxiliary	Percent
COA	Compliance with organizational arrangements	Constant	Percent	VHRM	Value of harmonious relationship maintenance	Auxiliary	Percent
OMC	organizational management changing	Auxiliary	Percent	VIB	Value of innovation behavior	Auxiliary	Percent
OMP	organizational management performance	Auxiliary	Percent	VOC	Value of organizational culture	Auxiliary	Percent
HOSD	Helps others to solve the difficulties	Constant	Percent	VOC-1	Value of organizational compliance	Auxiliary	Percent
HRMI	Harmonious relationship maintenance increment	Flow	Percent	VPP	Value of potential promotion	Auxiliary	Percent
HRS	Harmonious relationship with stakeholders	Constant	Percent	VPS	Value of public satisfaction	Auxiliary	Percent
IBI	Innovation behavior increment	Flow	Percent	WAOCB	Willingness to adopt organizational citizenship behavior	Auxiliary	Percent
IIC	Increasing index of conscientiousness	Auxiliary	Percent	WOI	Work overtime initiatively	Constant	Percent
IICB	Increasing index of collaboration behavior	Auxiliary	Percent	Y	Yearly	Constant	Percent

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3.5. Causal loop diagram

Key variables were identified when developing a qualitative model based on the literature (discussed in Section 2). In this study, the key variables in the proposed model are two main aspects: the identified dimensions of OCB and its driving factors. OCB refers to project compliance behavior, innovation behavior, collaboration behavior, conscientiousness behavior, and harmonious relationship maintenance behavior. Its motivations mainly involve project culture, potential promotion, corporate reputation, and public satisfaction. These variables not only serve as essential units of the model, but they define the boundary of the model.

Additionally, in the established model, OCB is the only factor that influences the performance of megaprojects, which means the time, budget, and quality in this study. The other factors that are out of the scope of this study are time, budget, and quality. The other factors are out of the scope of this study. After identifying the variables with the potential to influence the behavior of the proposed system, a qualitative analysis was carried out to identify the interactions among the variables. Figure 2, which consists of four feedback loops that determine the system's behavior by establishing connections among variables, illustrates the conceptual model of the qualitative analysis. Positive feedback loop R1: It can be seen from Figure 2 that the adoption of OCB would be reinforced.

Itself through the positive chain. Suppose that the employee performance accelerates through adopting OCB, bettering the employee performance during the construction phase. Consequently, considering the relationships between enterprises and the government, the organization's leader could have a higher potential for promotion (Müller et al., 2014). That is, participants in organizations are more willing to augment OCB, which will affect employee performance again (Yen et al., 2008). Positive feedback loop R2: In this loop, adopting OCB could reinforce itself through the feedback chain. Suppose that OCBs accelerate, then the organization`s performance will be positively influenced, and the public's satisfaction will be increased (Wang et al., 2018).

Furthermore, it positively contributes to the corporate reputation and thereby motivates participants to increase OCB (Wang et al., 2013). Hence, the magnified adoption of OCB will further accelerate the project performance. Positive feedback loop R3: This one shows a similar influence loop as R1. The only difference is that in loop R3, the improvements in the adoption of OCB directly lead to improvements in the Organizational culture (Wang et al., 2013). Negative feedback loop B1: In this loop, a change of any variable would negatively affect itself. If there is an increase in the adoption of OCB, then employee performance will be accelerated.

As a result, the public's satisfaction would be improved, which indicates that governmental regulations or policies would decline (Müller et al., 2014). Due to reduced willingness to OCB, the adoption of OCB will decrease accordingly.

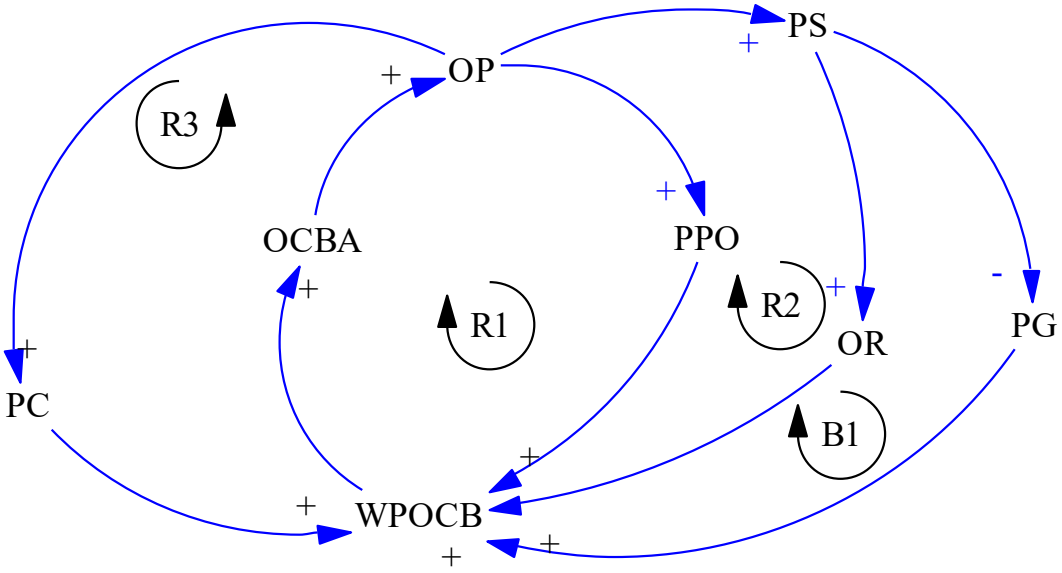

Figure 2. The causal loop diagram of the OCB system

3.6. Stock-Flow diagram

With the interrelationships underlying the identified variables defined within the causal-loop diagram, a stock-flow diagram was developed to quantify their impacts with the assistance of the Vensim software. A stock-flow diagram is a more detailed illustration of a causal-loop diagram. Furthermore, a stock-flow diagram consists of different kinds of icons so that the computer-based simulation can be run. To facilitate a better understanding, the proposed model and brief definitions of the variables within the model are shown in Figure 3 and Table 1, respectively. Before performing the simulation, it is necessary to ensure that all the variables in the model can be quantified. The variables used in this model were divided into three categories: Constant, dependent, and qualitative. Each type of variable has corresponding data sources. The value of the constant variables—expected to remain unchanged and will not be affected by other variables during the simulation period—were generally quantified by referring to the materials available, such as literature. The values of the dependent variables depend on one or more variables within the model in terms of mathematical functions. Various functions in the Vensim software can quantify the values of these kinds of variables (Li et al., 2014). The values of the qualitative variables were quantified in this study by the judgment of experts. Detailed data and equations related to the established model are shown in Appendix to facilitate an understanding the quantification process.

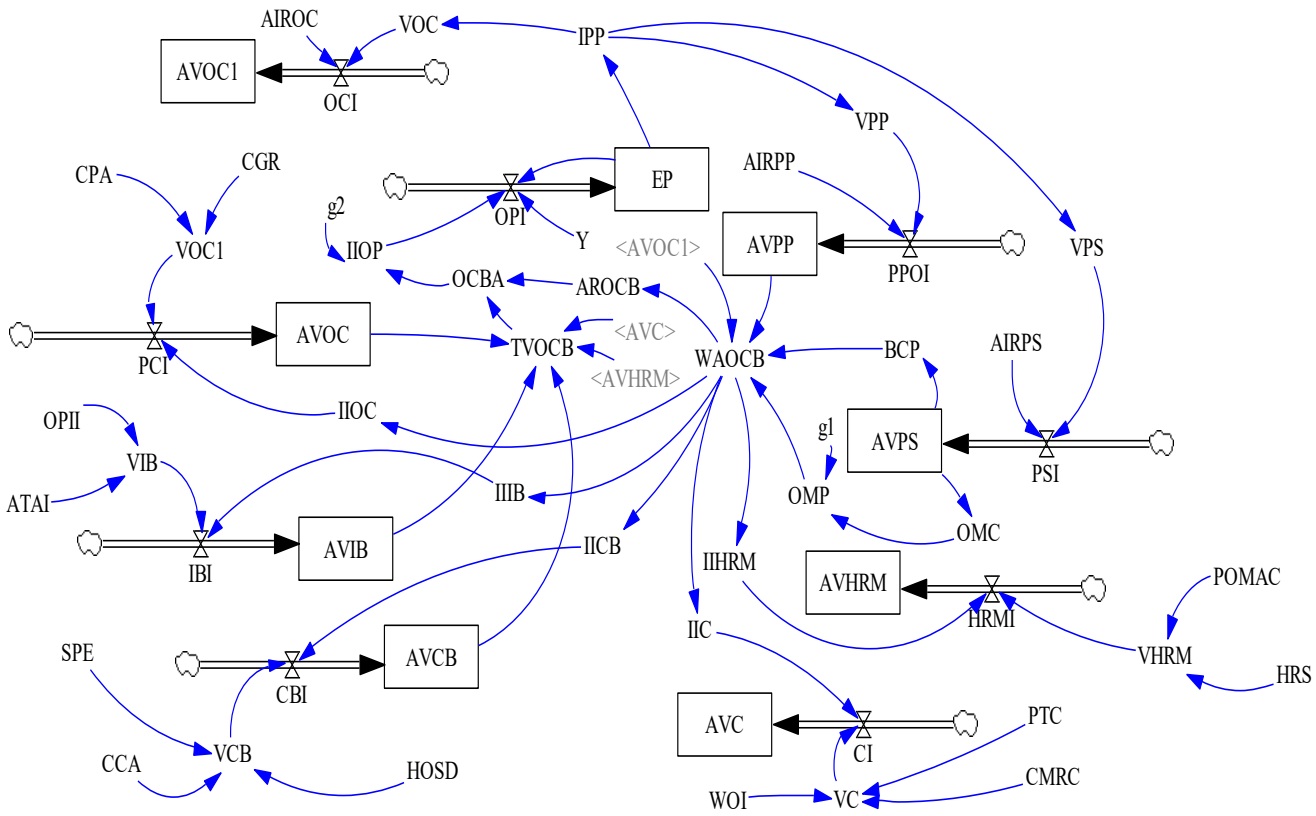

Figure 3. The stock-flow diagram of the model

3.6.1. Analyzing the behavior of the AVC index

AVC is considered one of the important aspects of accepting OCB, and it greatly impacts the promotion of willingness to accept OCB. Many indicators influence factors in this dimension. This research investigates the factors of a person's willingness to work overtime, volunteer missions, and conscious and voluntary participation in education. AVC among employees has had an upward trend with a low slope between 2017 and 2021. As is shown in Figure 3, from 2022 to 2027, according to the prevailing conditions of society and remote work, the sense of duty of the employees in doing the work during overtime hours or in remote work has had a relatively steep upward trend. According to the simulated 11-year period, this trend has an upward trend, and the results and changes of this factor are presented in Figure 4.

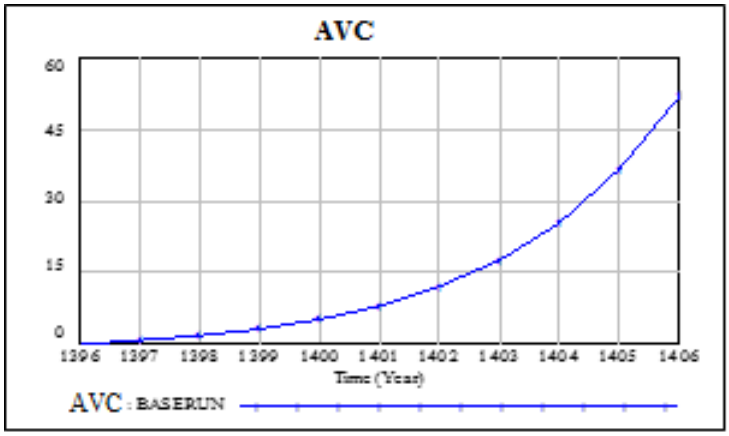

Figure 4. Simulation of conscientiousness index

3.6.2. Analyzing the behavior of the AVOC index

As can be seen in Figure 5, the AVOC of employees from 2017 to 2027 has been upwardly trending due to the upward trend of the influential indicators with a relatively steep slope.

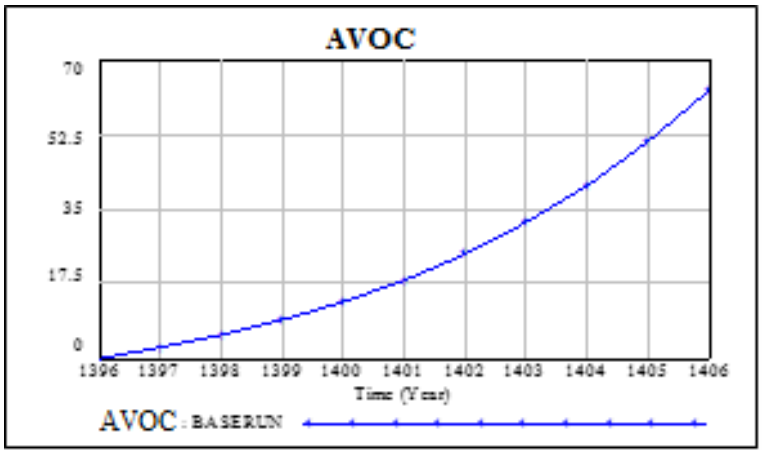

Figure 5. Simulation of organizational AVOC index

3.6.3. Analyzing the behavior of the maintenance of the AVHRM index

The maintenance of AVHRM within our organization, a key responsibility shared by colleagues and managers, is a pivotal factor in shaping employee performance and fostering a conducive work environment. This factor, like others, is on an upward trajectory, but its potential for growth in the coming years is particularly promising. By instilling a sense of enthusiasm among employees to actively participate in organization meetings and collaborate in activities, we can further amplify the impact of AVHRM. As illustrated in Figure 6, the AVHRM index has demonstrated a significant increase from 2017 to 2022, reaching an impressive 8.53%.

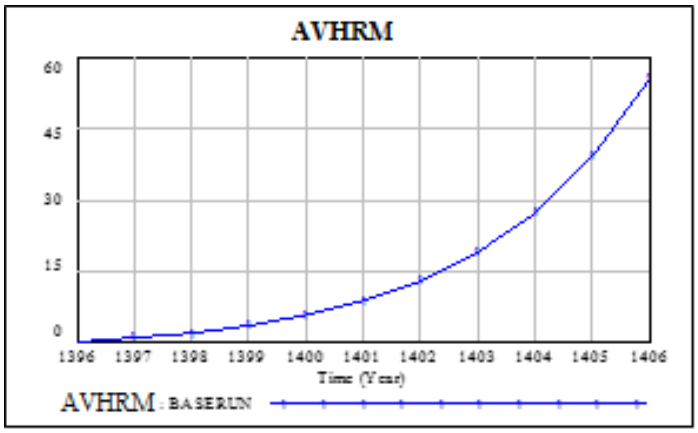

Figure 6. Simulation of the maintenance of AVHRM index

3.6.4. Analyzing the behavior of the AVCB index

AVCB is considered one of the other important aspects of accepting OCB, and it has a great impact on promoting willingness to accept OCB. This research investigates the factors of transferring experience and knowledge, helping others to solve problems and conflicts of active cooperation. Between 2017 and 2020, the cumulative value of collaborative behavior had an upward trend with a small slope, and this trend is increasing in the coming years, with the difference considering that the factors influencing AVCB change over time in an organization. It becomes an organizational culture, and knowledge and experience transfer foundations become strong. It is expected that after 2023, the incremental growth rate of this factor will increase dramatically compared to before. The results and changes of this factor are presented in Figure 7.

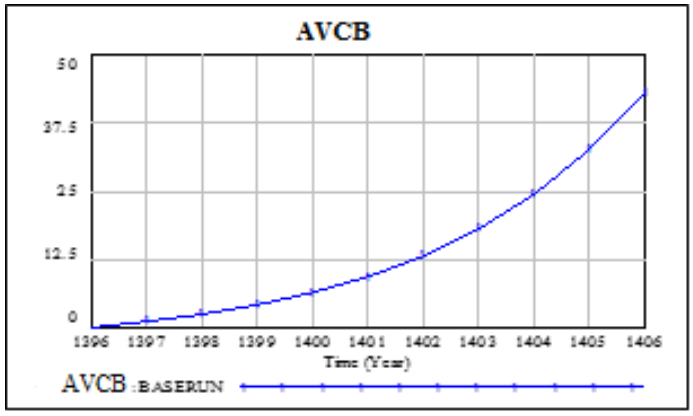

Figure 7. Simulation of the AVCB index

3.6.5. Analyzing the behavior of the AVIB index

As you can see in Figure 8, the AVIB from 2017 to 2027 has had an upward trend due to the upward trend of the influential indicators with a relatively steep slope.

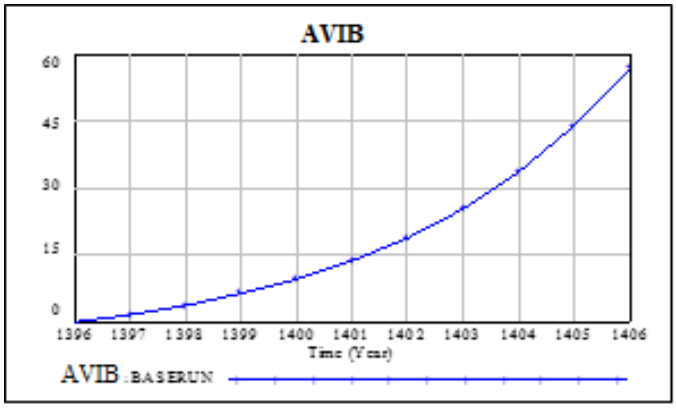

Figure 8. Simulation of innovative behavior index

3.6.6. Analyzing the behavior of the EP index

The EP index, a significant metric in OCB performance, has shown a gradual upward trend from 2017 to 2023. This trend, though slow, has a substantial impact. As shown in Figure 9, the OCB index has increased from 5% to 6.40% during the period of 2017 to 2022, primarily due to the positive trend of the EP index.

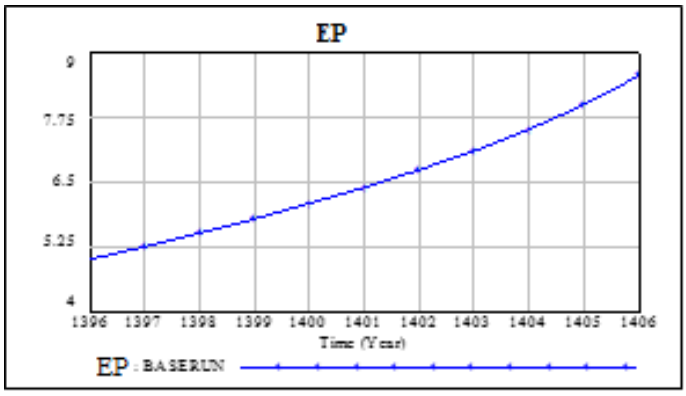

Figure 9. Simulation of employee performance index

3.6.7. Analyzing the behavior of the OCB index

One of the most important parameters in evaluating the performance of OCB. All indicators affecting this parameter (job satisfaction, organizational culture, employee opportunities for promotion, organization's reputation) had an upward trend with a very low slope. As seen in Figure 10, OCB showed an upward trend from 2017 to 2022. In these years, OCB has increased to 6.48%, and this is due to the upward trend of the indicators affecting this index.

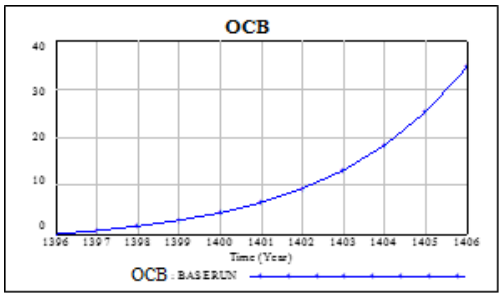

Figure 10. Simulation of OCB index

3.6.8. Analyzing the behavior of the AVOC-1 index

As Figure 11 shows, the OC increased from 4.90% to 5.60% from 2018 to 2023.

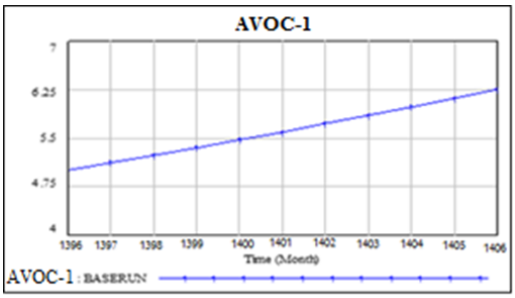

Figure 11. Simulation of organizational AVOC-1

3.6.9. Analyzing the behavior of the AVPS index

As shown in Figure 12, EP has increased from 5% to 5.90% from 2018 to 2023.

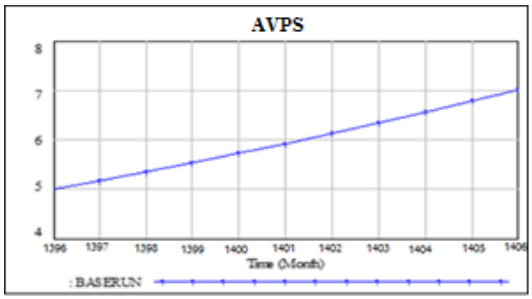

Figure 12. Simulation of AVPS index

3.6.10. Analyzing the behavior of the AVPP index

As shown in Figure 13, employee promotion opportunities increased from 5% to 7% from 2018 to 2023.

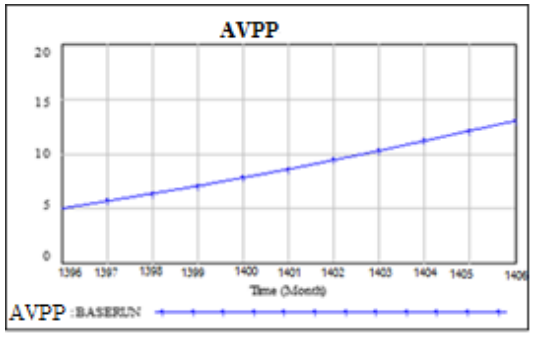

Figure 13. Simulation of AVPP index

4. Results of policy scenarios

4.1. Single-policy scenario

Considering the contribution of OCB to the improvement of employee performance, scholars in the academic and industrial areas have carried out various research on how to promote OCB. According to existing studies, political motivations, especially when reflecting a promotion, and project culture are widely regarded as typical factors (Li et al., 2014). Given that illustrating all factors concerning OCB is impractical due to the limited length of the paper, the two factors mentioned above were selected to simulate the policy analysis. Various scenarios were simulated and analyzed by implementing the two policies individually and in combination. Policy scenarios A and B are single-policy scenarios, meaning that only one variable was changed while the others remained unchanged. Policy scenario C is a multi-policy scenario in which two variables were changed simultaneously.

4.1.1. Scenario A: promotion effect

This one is a single-policy scenario examining the impacts of changing the AIRPP on EP, OCBA, AVC, AVCB, AVHRM, AVIB, and AVOC. To analyze the various possible situations, two sub-scenarios aside from the base run (the initial value of the AIRPP is 0.05) were designed in which the AIRPPs were 0.2 and 0.4, respectively. Moreover, these two scenarios were defined as PSA-1 and PSA-2. Table 1 shows that the increase in the AIRPP significantly contributed to the improvement in the OCBA, thereby enhancing the performance of the organization's employees. Specifically, the OCBA in PSA-1 and PSA-2 reached 77.67 and 82.85, respectively. Meanwhile, the EP in PSA-1 and PSA-2, reaching 41.9 and 44. 4.

In addition, the significant increase is also illustrated in the other five selected variables, namely, AVOC, AVIB, AVCB, AVC, and AVHRM, with values of 14.63, 18.37, 58.62, 33.38, and 59.32 in PSA-1 and 14.77, 18.53, 59.02, 38.72, and 59.72 in PSA-2, respectively, at the end of the simulation period. A possible reason for these simulation results is that the increased

promotion opportunities drive the employees to work more actively in such ways as to improve their special skills and to have more of an initiative to participate in project meetings and activities, which are likely to improve OCB and contribute to a better performance of employees.

4.1.2. Scenario B: cultural effect

The policy scenario B, similarly to Scenario A, is also a single policy scenario that is designed to verify the effect of the increase in the AIROC on EP, the OCBA, the AVC, the AVCB, the AVHRM, the AVIB, and the AVOC over the simulation period. To examine the impact of the improvement in the AIROC on the selected variables, two devised scenarios were simulated under policy scenario B for comparison against the baseline scenario, namely PSB-1 and PSB-2. The initial value of the AIRPC was 0.05 in the base run and increased to 0.2 and 0.4 in PSB-1 and PSB-2, respectively**.** As presented in Table 2, the results indicated that the rise in the AIROC could increase the value of the OCBA and EP from 81 and 43.67 in run PSB-1 to 85.11 and 45.25 in run PSB-2 at the end of the simulation period. The values of the AVOC, the AVIB, the AVCB, the AVC, and the AVHRM arrived at 14.67, 18.42, 58.75, 33.50, and 59.44 in PSB-2, and 14.87, 18.65, 59.3, 37.16, and 60.01 in PSB-2. The improvements in all the selected variables could probably result from the fact that the employee was influenced by a positive organizational culture within organizations and contributed to a high quality of their daily work, which is likely to lead to an improvement in performance. However, although the selected variables have increased in both PSA and PSB, some differences still exist in the simulation results of these two policy scenarios. Firstly, the simulation results of PSB are more moderate than those of PSA, indicating that organizational culture is more effective than providing opportunities for promotion to improve OCB and employee performance.

Secondly, PSA and PSB posed different effects on the AVPC, the AVIB, the AVCB, the AVC, and the AVHRM. Specifically, in Scenario A, the AVPC, the AVC, and the AVCB are the top three variables that improved significantly/In the meantime, the AVPC, the AVC, and the AVHRM are the top three in Scenario B. This result suggests that Scenario A could have more significant effects on collaboration behavior than on maintaining a harmonious relationship in Scenario B. The explanation is that project culture effectively contributes to fostering a harmonious atmosphere within organizations (Wang et al., 2018), especially in countries like China, where there is an emphasis on harmony and people show deep concern for group harmony.

Table 2. The simulation results of policy scenario A

	PSA-1							PSA-2						
Year	**OCBA**	**EP**	**AVOC**	**AVIB**	**AVCB**	**AVC**	**AVHRM**	**OCBA**	**EP**	**AVOC**	**AVIB**	**AVCB**	**AVC**	**AVHRM**
1396	0	5	0	0	0	0	0	0	5	0	0	0	0	0
1397	0.462	5.71	0.49	0.53	0.94	2.80	0.95	0.48	5.71	0.49	0.53	0.94	2.80	0.95
1398	1.21	6.54	1.11	1.22	2.27	5.72	2.30	1.27	6.54	1.11	1.23	2.27	5.79	2.30
1399	2.42	7.50	1.88	2.10	4.13	8.77	4.18	2.55	7.51	1.88	2.10	4.14	8.98	4.19
1400	4.33	8.65	2.82	3.20	6.70	11.70	6.78	4.56	8.65	2.83	3.21	6.72	12.35	6.80
1401	7.34	10.04	3.98	4.59	10.24	14.93	10.36	7.74	10.05	3.99	4.60	10.27	15.93	10.39
1402	12.04	11.77	5.38	6.31	15.06	18.29	15.24	12.73	11.8	5.41	6.34	15.12	19.72	15.3
1403	19.41	14.21	7.09	8.45	21.61	21.79	21.87	20.55	14.35	7.13	8.50	21.72	23.74	21.97
1404	30.94	18.41	9.15	11.1	30.49	25.45	30.85	32.82	18.77	9.21	11.17	30.65	28.04	31.02
1405	49.06	26	11.64	14.36	42.47	29.30	42.98	52.16	26.86	11.74	14.47	42.73	32.67	43.24
1406	77.67	41.9	14.63	18.37	58.62	33.38	59.32	82.85	44.4	14.77	18.53	59.02	38.72	59.72

Table 3. The simulation results of scenario B

	PSB-1							PSB-2						
Year	**OCBA**	**EP**	**AVOC**	**AVIB**	**AVCB**	**AVC**	**AVHRM**	**OCBA**	**EP**	**AVOC**	**AVIB**	**AVCB**	**AVC**	**AVHRM**
1396	0	5	0	0	0	0	0	0	5	0	0	0	0	0
1397	0.48	5.71	0.49	0.53	0.94	2.80	0.95	0.48	5.71	0.49	0.53	0.94	2.80	0.95
1398	1.27	6.54	1.11	1.22	2.27	5.71	2.30	1.28	6.54	1.11	1.23	2.27	5.78	2.30
1399	2.53	7.50	1.88	2.10	4.13	8.73	4.18	2.56	7.51	1.88	2.11	4.14	8.94	4.19
1400	4.53	8.65	2.82	3.21	6.71	11.87	6.79	4.60	8.66	2.83	3.22	6.73	12.29	6.81
1401	7.66	10.05	3.98	4.59	10.25	15.12	10.37	7.82	10.06	4	4.61	10.29	15.82	10.42
1402	12.57	11.8	5.39	6.32	15.08	18.48	15.25	12.89	11.81	5.43	6.36	15.16	19.56	15.34
1403	20.25	14.32	7.10	8.46	21.64	21.99	21.9	2.87	14.38	7.16	8.53	21.79	23.51	22.05
1404	32.27	18.69	9.17	11.12	30.54	25.64	30.9	33.44	18.86	9.26	11.23	30.77	27.73	31.13
1405	51.16	26.64	11.67	14.4	42.55	29.47	43.05	53.34	27.1	11.8	14.55	42.92	32.25	43.42
1406	81	43.67	14.67	18.42	58.75	33.50	59.44	85.11	45.25	14.87	18.65	59.3	37.16	60.01

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4.1.3. Scenario C: dual effects

This multi-policy scenario is designed to simulate the influence of the combined changes in the AIRPP and the AIRPC to facilitate a comprehensive understanding of how their changes affect the OCBA and EP. To be specific, five sub-scenarios were set, namely PSC-1 (AIRPC = 0, AIRPP = 0.4), PSC-2 (AIRPC = 0.1, AIRPP = 0.3), PSC-3 (AIRPC = 0.2, AIRPP = 0.2), PSC-4 (AIRPC = 0.3, AIRPP = 0.1), PSC-5 (AIRPC = 0.4, AIRPP = 0).

As illustrated in Table 3, two main results should be highlighted. Firstly, PSC-1 observed the most significant improvements both in OCBA and MPP, reaching 81.83 and 44.01, respectively; then followed by PSC-2, PSC-3, PSC-4, and PSC-5.

This simulation result shows that the higher the value of the AIROC in the sub-scenarios, the higher the value of the OCBA and EP would be. This finding is consistent with previous studies, which stated that promotion opportunities are more effective than the project culture in improving OCB and employee performance (Le et al., 2016), but also echoes the simulation results in the single-policy scenario. Secondly, the AIROC is 0 in PSC-1, or whenever the AIRPP is 0 in PSC-5, the values of OCBA and EP were not estimated as 0. The reason for this is that the system is organic while running in a highly iterative manner and because promotion and Organizational Culture are not the only two driving factors in this system; thus, even though the AIROC or the AIRPP is set to zero, it would not lead to a zero in OCBA and EP.

Table 4. The simulation results of scenario C

Year	PSC-1		PSC-2		PSC-3		PSC-4		PSC-5	
	OCBA	EP	OCBA	EP	OCBA	EP	OCBA	EP	OCBA	EP
1396	0	5	0	5	0	5	0	5	0	5
1397	0.48	5.71	0.48	5.71	0.48	5.71	0.48	5.71	0.48	5.71
1398	1.27	6.54	1.27	6.54	1.27	6.54	1.27	6.54	1.28	6.54
1399	2.54	7.51	2.54	7.51	2.55	7.51	2.55	7.51	2.55	7.51
1400	4.55	8.65	4.56	8.65	4.57	8.65	4.58	8.65	4.58	8.65
1401	7.70	10.05	7.72	10.05	7.75	10.05	7.77	10.05	7.79	10.06
1402	12.65	11.8	12.7	11.8	12.74	11.8	12.79	11.8	12.84	11.81
1403	20.39	14.33	20.48	14.34	20.58	14.35	20.67	14.36	20.76	14.37
1404	32.53	18.73	32.7	18.75	32.88	18.78	33.06	18.8	33.23	18.83
1405	51.61	26.75	51.95	26.81	52.28	26.88	52.62	26.95	52.96	27.02
1406	81.83	44.01	82.47	44.25	83.11	44.49	83.75	44.73	84.4	44.97

5. Conclusions

Considerable studies have been conducted to examine the relationship between OCB and employee performance in the last few decades. However, there is still a gap in studying the interdependent and dynamic relationships among the variables within the OCBs in the organization. Therefore, this study proposes using system dynamics to quantitatively study the

impact of OCB on employee performance. Based on SD modeling, both a causal loop diagram and a stock-flow diagram were proposed to identify the major variables and to describe their interrelationship. Once the model was validated, three policy scenarios, including two single policy scenarios and a multi-policy scenario, were adopted to simulate the performance of employees at various levels of OCB adoption in organizations. The simulation results indicated that an increase in the AIROC has more obvious effects on the improvement in OCB and in the performance of employees than those of the AIROC. Moreover, the simulation results of the multi-policy scenarios show that the higher the value of the AIRPP in combinations (the total value has been restricted), the higher the value of OCBA and employees' performance would be.

The main contributions of this study lie in four aspects:

- The OCB system's inherently dynamic nature, which needs to be addressed and has been neglected, has been well envisaged.
- The SD model not only facilitates the illustration of interrelationships among the variables from a quantitative perspective but also deepens the stakeholders' understanding of the entire system of OCB.
- The established model can serve as a laboratory and a platform to better simulate the potential effects of OCB on employees' performance and test the different scenarios of the possible futures that have been relatively less studied before.

Finally, the policy scenarios could identify the benefits that OCB would bring, delivering a clearer and perhaps more realistic view of the appropriate actions that improve employees' performance in the real world.

Organizational citizenship behavior can help the municipality improve the performance of employees and provide services in the following scenarios:

- Enhancing employee morale and satisfaction: Organizational citizenship behaviors, such as assisting colleagues and actively participating in volunteer activities, heighten employee morale and job satisfaction. Increased job satisfaction subsequently results in enhanced performance and decreased employee turnover.

- Enhancing collaboration and synchronization: When employees willingly assist one another and engage in teamwork, the organization's degree of cooperation and harmony is heightened. These collaborations enhance the procedures and overall efficiency of the municipality.

- Promoting innovation and creativity: Organizational citizenship behaviors can foster employees' creativity and facilitate the presentation of novel solutions. These advancements can potentially enhance work procedures and boost production within the municipality.

- Improving service to citizens: It's the employees who, by demonstrating organizational citizenship behavior, go above and beyond to serve citizens. This issue can improve the quality of municipal services to citizens and increase public satisfaction, making each employee a key player in this process.

Organizational citizenship behavior generally substantially influences the municipality's performance and the quality of services offered to citizens. It is achieved by enhancing work relationships, boosting job satisfaction, and fostering employee collaboration and unity.

Despite significant contributions, the two main limitations cannot be ignored. On the one hand, the SD method only pays attention to the general dynamic trends of prediction and does not emphasize the accurate value in a specific year. Therefore, it is suggested that is be applicable to long-term predictions that do not require accurate results. On the other hand, the SD model is a simplification and an abstraction of the system in the real world. Thus, only significant variables and their interrelationships are considered in the model development process in this study, which would adversely impact the accuracy and reliability of the simulation results.

Therefore, future research is encouraged to encompass more variables in the OCB system to increase its credibility and predict accuracy. In addition, given the limited length, only three policy scenarios have been simulated and analyzed by comparing the results with the base scenarios. In the future study, using the method proposed in this study, more similar simulations composed of different designed policies can be conducted and analyzed under different scenarios.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix

Equations of the model

ATAI = 4.07

CCA = 4.17

AIROC = 0.05

AIRPP = 0.05

AIRPS = 0.1
AVC(t) = AVC(t - dt) + (CI) ×dt
INTI AVC = 0
AVCB(t) = AVCB(t - dt) + (CBI) × dt
INTI AVCB = 0
AVHRM(t) = AVHRM(t - dt) + (AVHRMI) × dt
INTI AVHRM = 0
AVIB(t) = AVIB(t - dt) + (IBI) × dt
INTI AVIB = 0
AVOC(t) = AVPC(t - dt) + (PCI-1) × dt
INTI AVOC = 0
AVPP(t) = AVPP(t - dt) + (PPOI) × dt
INTI AVPP = 5
AVPC-1(t) = AVPC-1(t - dt) + (PCI) × dt
INTI AVPC-1 = 5
AVPS(t) = AVPS(t - dt) + (PSI) × dt
INTI AVPS = 5
HRS = 4.23
CBI = VCB × IICB
IICB = 1/5 × IAOCB
VCB = 1/3 × (CCA + HOSD + SPE)
CMRC = 4.28
CGR = 4.48
CI = IIC × VC
IIC = 1/5 × IAOCB
CPA = 4.38
PPMAC = 4.06
PTC = 4.21

VC = 1/3 × (CMRC + PTC + WOI)

BCP = 1/2 × AVPS
GMC = 1/2 × AVPS
GMP = GRAPH(GMC)
([(0,0)-
(100,80)],(0,0),(10,3),(20,6),(30,11),(40,16),(50,22),(60,26),(70,29),(80,31),(90,32.5),(100,33))
HRMI = IIHRM×VHRM
IIHRM = 1/5 × IAOCB
VHRM = 1/2× (BHRS + PPMAC)
HOSD = 4.37
IAOCB = 1/4 × (AVPP + GMP + BCP + AVPC-1)
IBI = IIIB × VIB
IIIB = 1/5 × IAOCB
VIB = 1/2 × (ATAIAATI + PPII)
IEP = EP
EPII = 3.98
OCBA = OCBAR ×TVOCB
OCBAR = IF THEN ELSE(IAOCB >= 100, 0.1, IAOCB/10)
VPC = 1/3 × IPP
PCI = AIRPC × VPC
PCI-1 = IIPC × VPC-1
IIPC = 1/5 × IAOCB
VPC = 1/3 × IPP
VOC-1 = 1/2 × (CGR + CPA)
MPP = MPP(t × dt) + (PPI) ×_ dt
INTI MPP = 5
PPI = IIPP × Y × MPP
IIPP = GRAPH(OCBA)
([(0,0)-(100,1)],(0,0),(10,0.02),(20,0.08),(30,0.13),(40,0.18),(50,0.24),(60,0.31),(70,0.35),
(80,0.39),(90,0.41),(100,0.42))
PPOI = AIRPP × VPP
PSI = AIRPS × VPS
VPS = 1/3 × IPP
SPE = 4.41
TVOCB = IF THEN ELSE((AVC +AVCB + AVHRM + AVIB + AVPC) > 100, 100,
(AVC + AVCB + AVHRM + AVIB + AVPC))
WOI = 4.29