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PAPER

Innovation and Optimization of Corporate Governance Models through Mobile Interactive Technology

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ABSTRACT

In the context of rapid globalization and the swift advancement of information technology (IT), traditional corporate governance models are increasingly challenged by complex business environments and the growing demand for diversified collaboration. These models often exhibit rigidity and inefficiency. The introduction of mobile interactive technology offers new possibilities for the innovation and optimization of corporate governance models. Through mobile interactive networks, resource allocation and collaboration between departments can be conducted flexibly and efficiently. Existing research predominantly focuses on traditional management information systems and centralized resource allocation methods, which frequently overlook the diversity and dynamic nature of internal resource demands within enterprises, making them inadequate for addressing the needs of modern corporations. This study proposes a collaborative interaction mechanism for corporate governance based on matching theory, designing a system model that includes collaborative task demanders and executors, and the social utility of mobile interactive networks. The findings demonstrate that this mechanism enables efficient resource allocation and stable collaborative interactions in complex environments, providing both theoretical support and practical guidance for the innovation of corporate governance models.

KEYWORDS

corporate governance, mobile interactive technology, matching theory, distributed matching algorithm, collaborative interaction mechanism

1 INTRODUCTION

With the rapid development of globalization and information technology (IT), corporate governance models are undergoing unprecedented transformations [1–4]. Traditional centralized management approaches are increasingly proving to be rigid and inefficient when confronted with complex business environments. In particular, as the demand for diversified collaboration within companies continues to grow, the optimization of resource allocation and collaborative interaction through innovative

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technological means has become crucial for enhancing the efficiency and competitiveness of corporate governance [5–9]. Mobile interactive technology, as an emerging digital tool, offers new perspectives for the innovation and optimization of corporate governance models. By leveraging mobile interactive networks, communication and collaboration between various departments within companies become more flexible and efficient, enabling swift responses to market changes and internal demands.

The study of the application of mobile interactive technology in corporate governance models holds significant practical relevance. Firstly, as enterprises expand in scale and their organizational structures become increasingly complex, traditional governance models struggle to adapt to rapidly changing market environments [10, 11]. The introduction of mobile interactive technology effectively breaks down information barriers, facilitates the rapid allocation of resources, and enhances decision-making efficiency [12–15]. Secondly, in the current context of intensified global competition, enterprises urgently need to optimize their internal governance structures through technological innovation to enhance market competitiveness and sustainable development capabilities. Therefore, exploring the application of mobile interactive technology in corporate governance not only contributes to improving internal collaboration efficiency but also provides technical support for the long-term development of enterprises in dynamic markets.

Although existing research has explored various pathways and technological approaches for optimizing corporate governance models, most studies have focused on traditional management information systems and centralized resource allocation methods [16, 17]. These research methods often overlook the diversity and dynamic nature of internal resource needs, lacking the flexibility required to function effectively in complex and volatile business environments. Moreover, there has been limited exploration of the integration of matching theory with corporate governance practices, and a systematic theoretical framework and application model have yet to be established. Therefore, there is an urgent need for a governance mechanism that can balance flexibility and efficiency to better meet the demands of modern enterprises.

This study aims to fill this study gap by proposing a collaborative interaction mechanism for corporate governance based on matching theory and constructing a system model grounded in mobile interactive networks. The study focuses on two main aspects: the design of the system model, which encompasses collaborative task demanders and executors, and the social utility of mobile interactive networks; and the exploration of a collaborative interaction mechanism for corporate governance based on matching theory, which utilizes a distributed matching algorithm to achieve optimal resource allocation. Through this study, not only is new theoretical support provided for the innovation of corporate governance models, but practical solutions for governance optimization in real-world applications are also offered.

2 MOBILE INTERACTIVE NETWORK SYSTEM MODEL FOR CORPORATE GOVERNANCE

In the context of corporate governance collaborative interaction, the collaborative mechanism based on matching theory and mobile interactive networks differs significantly from traditional collaborative mechanisms in two key aspects:

1. Incorporation of social networks within the organization and among stakeholders: This study introduces the social relationship networks between employees within the company and its relevant stakeholders as a crucial factor for

incentivizing collaboration. This approach not only promotes resource sharing and collaboration among employees but also enhances internal cohesion and collaborative efficiency within the company. By considering these social relationships, each employee or department is able to allocate resources and assign tasks based on a broader and deeper network of interactions, thereby achieving optimal resource allocation and maximization of utility.

2. Decentralized collaborative interaction mechanism: The proposed collaborative interaction mechanism is entirely decentralized, with no reliance on any intermediary management layer or agent. The decentralized nature of this mechanism significantly reduces the complexity and burden associated with traditional centralized management while simultaneously granting employees greater autonomy and flexibility. This autonomy not only increases employee engagement but also allows the corporate governance model to become more adaptable, enabling it to respond more swiftly to changes in the market environment. In this scenario, interdepartmental collaborative interaction no longer depends on fixed management processes or hierarchical structures but is instead driven by a dynamic mechanism based on matching theory, enabling spontaneous resource allocation and efficient utilization, thereby driving innovation and optimization in corporate governance models.

The application scenario constructed based on the mobile interactive networks encompasses multiple collaborative task demanders and executors. Specifically, the set of collaborative task demanders is denoted as $L = \{1, 2, \ldots, L\}$, and the set of collaborative task executors is denoted as $V = \{1, 2, \ldots, V\}$, where collaborative task demanders are required to allocate part of their tasks to nearby task executors. Furthermore, to facilitate analysis and derive valuable insights, the quasi-static scenario assumption commonly used in other studies was referenced, where the set of collaborative task executors remains constant over a certain period.

In the application scenario, task demanders and executors achieve efficient collaboration through the mobile interactive network system. The construction principles of this system model can be elaborated in detail across three key aspects:

3. Utility model of collaborative task demanders: Figure 1 illustrates the workflow of collaborative communication for collaborative task demanders. For each collaborative task demander $u \in L$, a utility function was defined in this study to measure the satisfaction level of the task demander upon receiving the required resources. Specifically, let a_u denote the quantity of collaborative resources, such as technical support, personnel, or information, that the task demander u requires. The design of the utility function takes into account several factors, including the urgency of the task demander's resource needs, the scarcity of the resources, and the quality of the resources. This utility function can be used to evaluate the utility maximization for the task demander under given resource conditions, thereby guiding the rational allocation of resources. Assuming the utility level of the collaborative task demander is represented by $q_u > 0$, the available resource capacity of the collaborative task executor k is represented by B_k, and the strength of the social relationship between the collaborative task demander u and the collaborative task executor k is denoted by β_u^k. The specific definition is given by the following equation:

$$i_u^k(a_u) = \begin{cases} \beta_u^k q_u \ln(1 + a_u), a_u \le B_k \\ 0, else \end{cases} \tag{1}$$

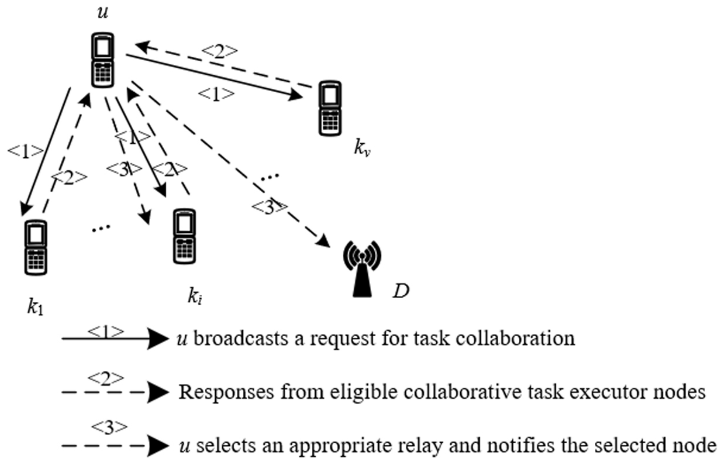

Fig. 1. Workflow of collaborative communication for collaborative task demanders

4. Cost model for collaborative task executors: In the collaborative interactions of corporate governance, collaborative task executors play a crucial role as resource providers. Each collaborative task executor possesses a certain resource limit, which may include manpower, time, equipment, or technology. It is assumed that each collaborative task executor is willing to share its available resources with multiple task demanders, provided that the total shared resources do not exceed its capacity. To better describe the supply behavior of collaborative task executors, a cost function was constructed in this study, representing the cost incurred by the task executor to complete the assigned tasks. This cost encompasses not only direct resource consumption but also opportunity costs, time costs, and resource utilization efficiency. The design of the cost function is intended to balance the contributions and benefits of the task executors, preventing excessive resource allocation or undue burden on the executors. Assume the cost level of collaborative task executor k is denoted by n_k, and the resource consumption quantity by the task demander is represented by b_u. Specifically, when collaborative task executor k provides services to a task demander, the cost $z_k^u(b_u)$ is defined as follows:

$$z_k^u(b_u) = \left(1 - \beta_k^u\right) n_k b_u^2 \tag{2}$$

When the importance of the unit resource used is o, the benefit generated by collaborative task executor k when providing services to a task demander is:

$$M_k^u(b_u) = o b_u - z_k^u(b_u) \tag{3}$$

$$\overline{M_k^u}(b_u) = o - \left(1 - \beta_k^u\right) n_k b_u \tag{4}$$

An analysis of the above equations clearly indicates that the higher the importance (o) of the resource, the greater the average benefit. Therefore, it follows that:

$$\overline{M_k^u} > \overline{M_k^{u'}}(b_{u'}), when \left(1 - \beta_k^u\right) b_u < \left(1 - \beta_k^{u'}\right) b_{u'} \tag{5}$$

5. Social utility model for corporate governance: Figure 2 demonstrates the workflow of mobile interactive networks designed for collaborative interaction in corporate governance. In this context, the social utility of the mobile interactive

networks is a critical design objective, typically used to measure the overall effectiveness of the entire system. The social utility was defined as the sum of the utilities of all collaborative task demanders minus the sum of the costs incurred by all collaborative task executors in this study. Through this definition, the system model can holistically consider the interests of all parties involved, thereby maximizing the overall collaborative efficiency. The specific expression is as follows:

$$D = \sum_{u \in L} \sum_{k \in V} i_u^k (a_u) - \sum_{k \in V} \sum_{u \in L} z_u^k (b_u) \tag{6}$$

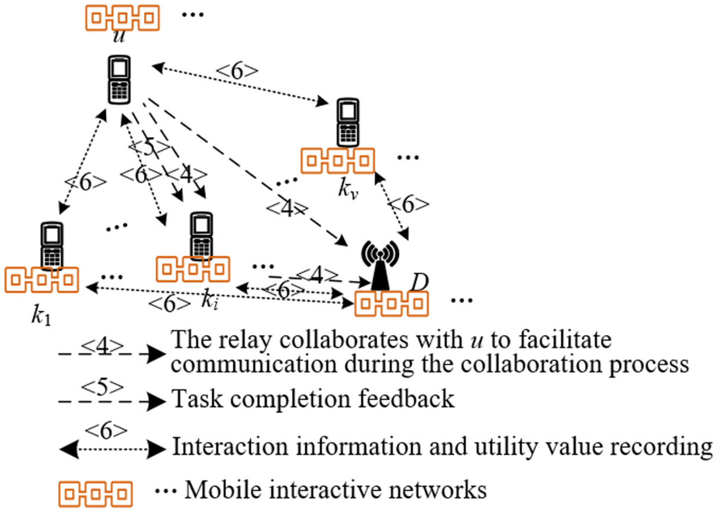

Fig. 2. Workflow of mobile interactive networks for collaborative interaction in corporate governance

The construction of the social utility model not only focuses on the resources acquired by the task demanders but also emphasizes the contributions and burdens of the task executors. This model assists in finding the optimal balance between utility and cost within corporate governance, thus achieving optimal resource allocation and maximizing collaborative efficiency.

In specific corporate governance scenarios, the constructed system model can dynamically adjust resource allocation strategies to address changing demands across different time periods or tasks. By approaching the maximization of social utility in corporate governance, the model facilitates efficient collaboration between various departments or employees within the company, thereby enhancing overall governance effectiveness. Additionally, this model supports decentralized management, reducing the complexity of traditional centralized management and increasing the company's flexibility in responding to rapidly changing market environments.

To better represent the task matching and execution status of collaborative task executors, a $L \times V$ matrix ε was defined in this study, where the elements e_{uk} are either 0 or a_u. When $e_{uk} = a_u$, it indicates that collaborative task demander u has assigned its task to collaborative task executor k for processing. Otherwise, it indicates that collaborative task demander u has not assigned its task to collaborative task executor k. To meet the needs of the collaborative task demanders, it is assumed that each collaborative task executor can fulfill the requirements of at least one collaborative task demander. Since the tasks of each collaborative task demander are indivisible and each resource provider can simultaneously accept tasks from multiple collaborative task demanders based on its available resource capacity, the following two constraint conditions were further derived in this study:

$$\sum_{u\in L} e_{uk} \le B_k \tag{7}$$

$$\sum_{k\in V} e_{uk} \le a_u \tag{8}$$

Therefore, the ultimate objective of this study is to maximize social utility, which can be expressed as follows:

$$\begin{aligned} &\underset{\eta}{MAX} \sum_{u\in L}\sum_{k\in V} iu_i^k(a_u) - \sum_{k\in V}\sum_{u\in L} z_u^k(b_u) \\ &ts. \quad \sum_{u\in L} e_{uk} \le B_k \\ &\qquad \sum_{k\in V} e_{uk} \le a_u \\ &\qquad e_{uk} = \{0, a_u\} \end{aligned} \tag{9}$$

3 COLLABORATIVE INTERACTION MECHANISM IN CORPORATE GOVERNANCE BASED ON MATCHING THEORY

In the collaborative interaction context of corporate governance, the Gale-Shapley (GS) algorithm based on mobile interactive networks was introduced in this study to optimize resource allocation and task collaboration. In this scenario, the matching process between collaborative task demanders and executors can be achieved through the GS algorithm, ensuring efficient resource allocation and maximized collaboration.

The specific steps of the GS algorithm in the context of corporate governance collaborative interaction are as follows:

First round of proposal phase: During this phase, each collaborative task demander submits a request to the collaborative task executor that it deems most suitable, based on its priority of needs. These requests are typically founded on the task requirements or project demands of the task demander.

First round of selection phase: Upon receiving multiple requests from different task demanders, the collaborative task executor selects the demander that best aligns with its current task objectives from its priority list. This selected demander is temporarily accepted as a candidate, though not immediately confirmed. Other task demanders' requests are temporarily rejected. If a particular task executor does not receive any requests, it waits for the next round.

N-th round: In subsequent rounds, task demanders who have not yet secured a match continue to submit requests to the next collaborative task executor on their list. Simultaneously, the task executors review all the requests they have received, including those previously held as candidates. During this process, the executors re-evaluate all requests and select the task demander that best fits their current priorities. If the initially selected task demander is no longer the optimal choice, it will be rejected and revert to an unmatched status, requiring it to submit a new request in the next round.

Repetition process: The above process is repeated until all collaborative task demanders and executors have successfully been matched. Throughout this process, task demanders progressively submit requests to the next executor on their list, while task executors continually refine their choices until no task demander or executor remains unmatched.

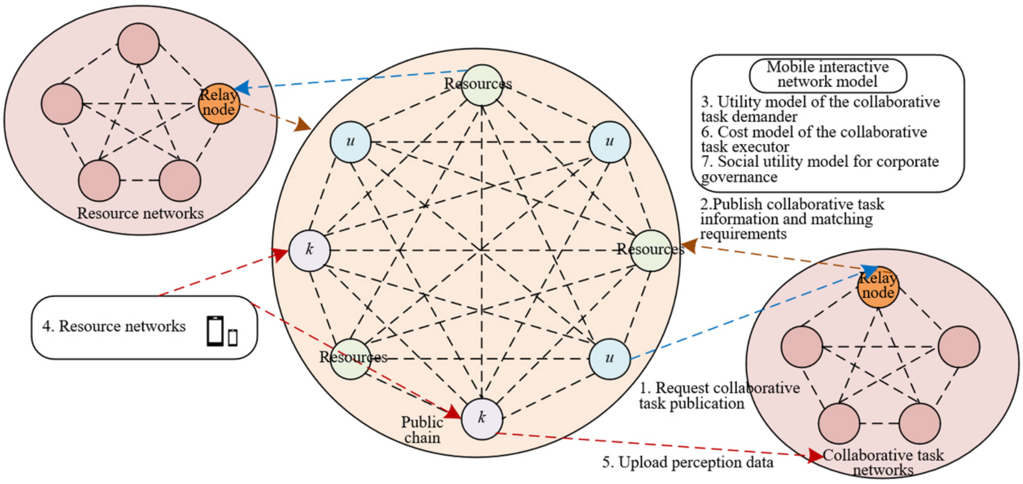

Fig. 3. Schematic of the collaborative interaction mechanism in corporate governance based on matching theory

Figure 3 illustrates a schematic of the collaborative interaction mechanism in corporate governance based on matching theory. Since collaborative task demanders need to match their tasks to a collaborative task executor, and each task executor can allocate its resources to multiple task demanders, the collaborative interaction problem in corporate governance can be characterized as a one-to-many matching problem between the set of task demanders and the set of task executors. This problem can be described as follows: each task demander, based on its task requirements, must assign portions of its tasks to one or more task executors. Conversely, each task executor can accept task requests from multiple task demanders, but its total task load must not exceed its resource capacity.

Specifically, task demanders prioritize maximizing the utility of task completion by seeking out collaborative task executors that can most effectively meet their task requirements. Therefore, each task demander evaluates all potential task executors based on factors such as the quality of support, speed, and resource capacity provided by each executor and generates a descending preference list. In this list, the task demander's most preferred executor is the one that offers the highest utility. Conversely, when collaborative task executors receive requests from multiple task demanders, they determine their preference order based on the average cost they would incur. Task executors tend to favor those task demanders that impose the lowest cost, thereby minimizing the opportunity cost and actual execution cost of their resource use. As a result, each task executor forms an ascending preference list, ranking task demanders based on factors such as the number of resources required, the urgency of the task, and the resource consumption needed to complete the task. The most preferred task demander on this list is the one that presents the lowest average cost to the executor.

To accurately describe the matching process in this scenario, the following fundamental definitions were introduced in this study:

Definition 1: One-to-many matching: In the collaborative interaction context of corporate governance, a one-to-many matching (ω) is defined as a mapping between the set of collaborative task demanders U and the set of collaborative task executors V, satisfying the following conditions:

a) For a collaborative task demander u, $\omega(u)$ indicates that the task demander u is either matched with a specific task executor k or not matched with any executor. Additionally, $|\omega(u)| \in \{0, 1\}$ signifies that each task demander can be matched with at most one task executor.
b) For a collaborative task executor k, $\omega(k)$ indicates that the task executor k can be matched with one or more task demanders, or it may not be matched with any demander. Furthermore, $|\omega(k)| \in \{0, 1, 2, \ldots, w_k\}$ indicates that the number of task demanders that can be matched with each task executor cannot exceed its maximum capacity (w_k).
c) Symmetry of matching: when $\omega(u) = k$, if and only if $\omega(k) = u$, it means that the matching relationship is bidirectional. A task executor k must also be matched with a task demander u if and only if the task demander is matched with the task executor.

Definition 2: Stable matching: In the context of collaborative interaction in corporate governance, a matching ω is considered stable if and only if it is not disrupted by any individual or matching pair. Specifically, for a collaborative task demander u and a collaborative task executor k, the matching ω is disrupted if u prefers an unmatched collaborative task executor k' over its current match u, and k' also prefers u over its current matched task demander. Similarly, for a collaborative task executor k, the matching ω is disrupted if k can find an unmatched task demander u' that imposes a lower cost than any of the currently matched task demanders.

In practical corporate governance scenarios, collaborative task demanders and executors are often widely distributed with diverse needs. Different departments or project teams may have varying resource demands at different times, while the capacity and load of task executors also fluctuate. In this collaborative context, the primary goal of task demanders is to offload tasks to executors that can maximize utility, while executors aim to minimize overall resource consumption and service costs by judiciously selecting service recipients. Traditional centralized matching algorithms often struggle to adapt to the dynamic and varied business demands and resource distributions. To address these challenges, a distributed matching algorithm based on the GS algorithm was proposed in this study. This algorithm was designed to flexibly achieve collaborative matching in such dynamic environments, ensuring that task demanders efficiently match with the most suitable task executors. At the same time, it allows task executors to optimally select service recipients based on actual load and cost minimization principles, thereby enhancing resource utilization.

The proposed algorithm comprises three key stages, each applied within the context of corporate governance as follows:

Stage 1: Information exchange phase: In this phase, collaborative task demanders and executors within the company exchange basic information via the mobile interactive networks. This information includes the specific types and quantities of resources required by the task demanders and the currently available resources of the task executors.

Stage 2: Initialization phase: During this phase, each task demander and task executor initializes their preference lists based on their characteristics and needs. Task demanders rank the task executors in a descending order of preference based on factors such as capability, response speed, and resource quality.

Meanwhile, task executors generate an ascending preference list based on the resource demand, task urgency, and service cost associated with each task demander. At this stage, all task demanders are placed in an unmatched set (*UNMATCH*), indicating that they have not yet established a matching relationship with any task executor.

Stage 3: Matching phase: This phase is the core of the algorithm and is divided into two steps:

1. All task demanders in the *UNMATCH* set send matching requests to the task executor they most prefer according to their preference list. This request represents the task demander's desire to receive support from the chosen task executor.
2. Upon receiving multiple matching requests, the task executors select those task demanders that best align with their preference list based on a relative optimality principle. Task executors prioritize those demanders that minimize their service costs.

This matching process is repeated until the *UNMATCH* set is empty, indicating that all task demanders have successfully matched with a task executor.

4 EXPERIMENTAL RESULTS AND ANALYSIS

The experimental results illustrated in Figure 4 indicate an upward trend in the social utility of corporate governance for both the GS algorithm and the proposed method as the number of collaborative task demanders increases. This suggests that both algorithms effectively enhance social utility when handling a larger number of collaboration tasks. However, a closer examination of the data reveals that the proposed method achieves a social utility of 18 when the number of demanders is two, slightly higher than the 16 achieved by the GS algorithm. As the number of demanders increases to six, the social utility of the proposed method reaches 54, again surpassing the 52.5 achieved by the GS algorithm. Overall, the proposed method consistently demonstrates slightly higher social utility across various numbers of demanders, indicating that the distributed matching algorithm proposed in this study offers a certain advantage in enhancing social utility. This advantage is attributed to the proposed method's consideration of more flexible resource allocation strategies and its higher efficiency in computational complexity during the matching process. As a result, it optimizes resource allocation more effectively in complex task demand scenarios, thereby improving overall social utility.

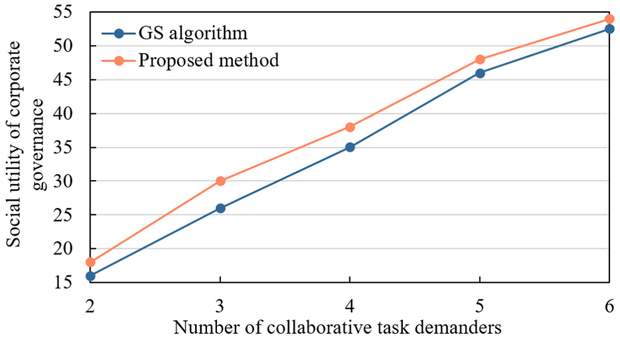

Fig. 4. Variation and comparison of social utility in corporate governance with the number of collaborative task demanders using different methods

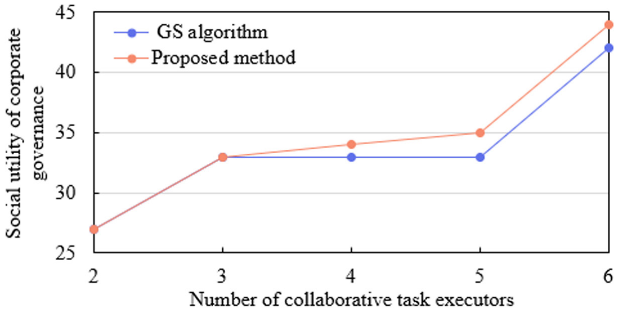

Fig. 5. Variation and comparison of social utility in corporate governance with the number of collaborative task executors using different methods

The experimental results presented in Figure 5 reveal that as the number of collaborative task executors increases, both the GS algorithm and the proposed method exhibit an overall upward trend in the social utility of corporate governance. However, the rate and pattern of this increase differ between the two methods. When the number of task executors is two and three, the social utility values of both methods are identical, at 27 and 33, respectively. As the number of executors increases to four, five, and six, the social utility achieved by the proposed method gradually surpasses that of the GS algorithm, with values of 34, 35, and 44, compared to the GS algorithm's 33, 33, and 42. This indicates that in scenarios with a higher number of task executors, the proposed method demonstrates a distinct advantage in enhancing social utility, particularly when the number of executors is relatively large. This advantage arises from the proposed method's ability to more effectively manage the complex relationships between multiple task executors during the distributed matching process, thereby optimizing resource allocation and matching outcomes and ultimately improving overall social utility. In contrast, although the GS algorithm performs well when the number of executors is low, its rate of improvement becomes relatively limited as the number of executors increases because of its inherent limitations in handling complex matching relationships.

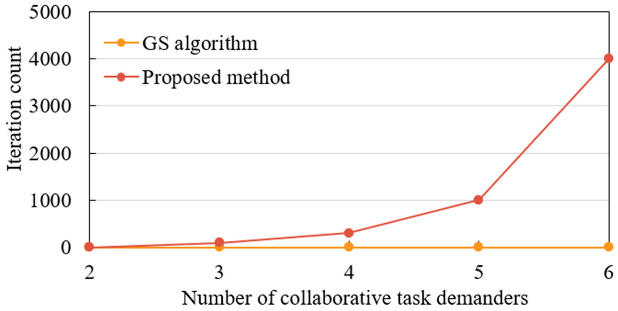

Fig. 6. Variation and comparison of iteration count with the number of collaborative task demanders using different methods

The experimental results shown in Figure 6 indicate that as the number of collaborative task demanders increases, the iteration count for the proposed method exhibits significant exponential growth, while the GS algorithm consistently maintains an iteration count of zero, indicating no iterations were performed. When the number of demanders is two, the iteration count for the proposed method is zero, identical to that of the GS algorithm. However, as the number of demanders increases to three, the iteration count for the proposed method rapidly rises to 100. Further increases in the number of demanders to four, five, and six results in iteration counts of 300, 1,000, and 4,000, respectively. In contrast, the iteration count for the GS algorithm remains at zero across all conditions, indicating that it failed to perform any iterative optimization. From an analytical perspective, as the number of collaborative task demanders grows, the sharp increase in iteration count for the proposed method reflects the need for more iterations to achieve an optimal matching outcome when dealing with more complex matching problems. This also demonstrates that the proposed method possesses greater adaptability and processing capability in the face of increased complexity, albeit at the cost of higher computational requirements. On the other hand, the GS algorithm's iteration count remains at zero regardless of the number of demanders, suggesting that it either fails to find a viable solution under these conditions or has limitations in its applicability.

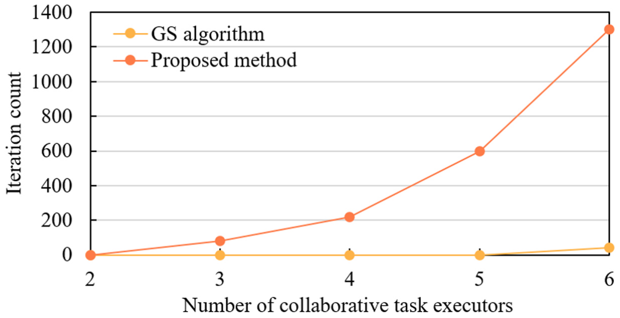

Fig. 7. Variation and comparison of iteration count with the number of collaborative task executors using different methods

The experimental results shown in Figure 7 reveal that as the number of collaborative task executors increases, the iteration count for the proposed method rises significantly. However, the iteration count for the GS algorithm remains at zero until the number of executors reaches six, at which point it performs 40 iterations. When the number of executors is two, the iteration counts for both methods are zero. However, as the number of executors increases to three, four, five, and six, the iteration count for the proposed method increases to 80, 220, 600, and 1,300, respectively, demonstrating a clear upward trend. In contrast, the GS algorithm only performs iterations when the number of executors reaches six, with 40 iterations, and no iterations are performed under other conditions. The analysis suggests that while the proposed method requires more iterations when dealing with more complex matching problems of collaborative task executors, it effectively addresses these complexities and progressively approaches an optimal matching result. In contrast, the GS algorithm fails to perform effective iterations when the number of executors is relatively low, indicating limitations in handling matching problems under these conditions and its inability to find feasible solutions with fewer executors. It is only when the number of executors reaches 6 that the GS algorithm begins to iterate, but its iteration count remains significantly lower than that of the proposed method.

The experimental results illustrated in Figure 8 show different growth trends in social utility for corporate governance using the GS algorithm and the proposed method under varying relationship intervals ([0.9, 1] and [0.5, 0.6]) as the number of collaborative task demanders increases. In the higher relationship interval ([0.9, 1]), the social utility of both algorithms increases with the number of demanders, with the proposed method consistently achieving slightly higher social utility than the GS algorithm. For example, when the number of demanders is two, the social utility of the proposed method is 43, slightly higher than the GS algorithm's 42; when the number of demanders increases to six, the proposed method's social utility reaches

120, surpassing the GS algorithm's 110. In contrast, in the lower relationship interval ([0.5, 0.6]), the overall level of social utility is lower, and the growth is more volatile. For instance, when the number of demanders is four, the proposed method's social utility is 21, significantly higher than the GS algorithm's 14, indicating a certain advantage. The analysis suggests that in the higher relationship interval ([0.9, 1]), the proposed method consistently achieves higher social utility compared to the GS algorithm, particularly as the number of demanders increases. This finding indicates that when the degree of cooperation is higher, the proposed method more effectively optimizes resource matching and enhances governance efficiency. Even in the lower relationship interval ([0.5, 0.6]), although the overall social utility of both algorithms is lower, the proposed method still outperforms the GS algorithm in multiple scenarios and demonstrates more stable performance, especially when the number of demanders is larger.

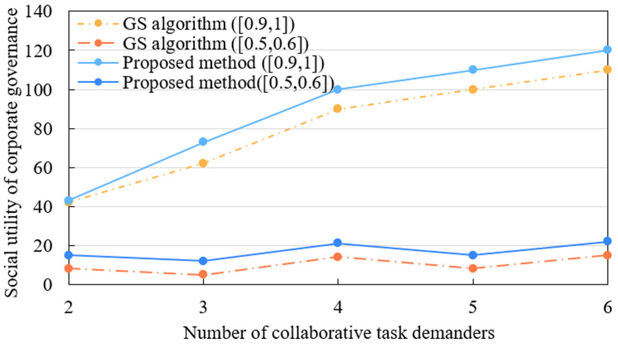

Fig. 8. Variation of social utility in corporate governance with the number of collaborative task demanders under different relationship intervals

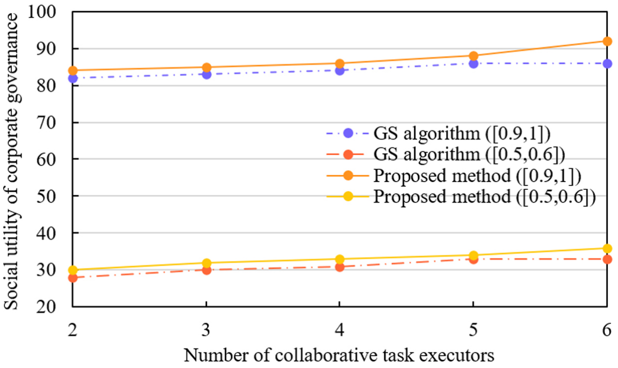

Fig. 9. Variation of social utility in corporate governance with the number of collaborative task executors under different relationship intervals

The experimental results shown in Figure 9 indicate that under different relationship intervals ([0.9, 1] and [0.5, 0.6]), both the GS algorithm and the proposed method demonstrate an upward trend in the social utility of corporate governance as the number of collaborative task executors increases. However, there are notable differences in the rate of increase and the final outcomes. In the higher relationship interval ([0.9, 1]), the social utility for both methods increases steadily as the number of executors grows, with the proposed method consistently achieving higher utility than the GS algorithm. For example, when the number of executors is two, the proposed method's social utility is 84, slightly higher than the GS algorithm's 82.

When the number of executors reaches six, the social utility of the proposed method rises to 92, significantly exceeding the GS algorithm's 86. In the lower relationship interval ([0.5, 0.6]), although the overall social utility of both algorithms is lower, the proposed method still outperforms the GS algorithm across all executor count scenarios as the number of executors increases. For instance, when the number of executors is 6, the social utility of the proposed method is 36, compared to the GS algorithm's 33. The analysis indicates that the proposed method consistently achieves higher social utility than the GS algorithm in the higher relationship interval ([0.9, 1]), with its advantage becoming more pronounced as the number of executors increases. This suggests that in scenarios with stronger cooperative relationships, the proposed method is more effective in optimizing resource allocation and matching outcomes, thereby enhancing overall governance efficiency. In the lower relationship interval ([0.5, 0.6]), although the overall social utility is lower, the proposed method still slightly outperforms the GS algorithm in each scenario, demonstrating its stability and adaptability in handling weaker cooperative relationships.

Therefore, the proposed collaborative interaction mechanism based on matching theory excels in scenarios with strong cooperative relationships and maintains advantages in weaker ones, effectively supporting and optimizing various corporate governance types.

5 CONCLUSION

This study aims to fill the research gap in applying matching theory to the collaborative interaction mechanism for corporate governance. A collaborative interaction mechanism for corporate governance based on matching theory was proposed. Then a system model built on mobile interactive networks was constructed in this study to explore how optimal resource allocation can be achieved through a distributed matching algorithm. This study is divided into two main parts: first, the design of a system model encompassing collaborative task demanders and executors and the influencing factors of social utility within mobile interactive networks; second, the optimization of resource allocation through the proposed matching theory-based collaborative interaction mechanism for corporate governance. The experimental results show the variation in social utility for corporate governance and iteration counts with changes in the number of collaborative task demanders and executors, comparing the performance of the GS algorithm and the proposed method under different relationship intervals.

Based on the comprehensive analysis of experimental results, it can be concluded that the proposed method consistently achieves higher social utility and demonstrates more stable performance under various conditions of task demander and executor numbers, particularly within the higher relationship interval ([0.9, 1]). The proposed method gradually optimizes matching outcomes through a higher number of iterations, showing strong adaptability and processing capability in more complex scenarios. In contrast, the GS algorithm exhibits limitations when dealing with complex collaboration relationships, especially within the lower relationship interval ([0.5, 0.6]), where its optimization effects are inferior to the proposed method. This study introduces a novel governance mechanism based on matching theory, effectively enhancing the social utility of corporate governance. However, a limitation is the potential increase in computational costs due to higher iteration counts. Future research could aim to refine the algorithm to minimize iterations while ensuring efficient matches. Further exploration could also extend to the mechanism's applications in more complex, multi-task, multi-party collaboration scenarios.

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