Knowledge Heterogeneity and Innovation Performance: The Channel Role of Role Stress

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Abstract. Based on the information decision-making theory and information preservation theory, in this paper, methods of expert interview and questionnaire survey were employed to obtain data, and the relationships between knowledge heterogeneity, role stress, and innovation performance of employees in high-tech enterprises got studied, and the following conclusions are drawn: knowledge heterogeneity positively influences role stress, and leads to variations in task execution, which will cause inconsistency in the internal level of team organization, and then strengthen role stress; role stress exerts an adverse impact on innovation performance, which means that the higher role stress results in a lower possibility of new ideas and thus poorer innovation performance; a significantly positive correlation between knowledge heterogeneity and innovation performance has been identified as corporate innovation performance gets enhanced with the diversification and heterogeneity of knowledge; and role stress plays a partial mediating role in the process of how knowledge heterogeneity affects innovation performance.

Keywords: Knowledge heterogeneity; Role stress; Innovation performance;theoretical model

1 Introduction

As the market economy enters the era of the Internet-based sharing economy, the capitalization competition for knowledge and information becomes increasingly intense, and hence the market across the board growingly craves knowledge and talent. This status quo also leads to the continuous upgrade and optimization of enterprises in terms of knowledge capital agglomeration and competition and has become a non-negligible focus in corporate management. People are those who mainly contribute to the knowledge creation for enterprises, so classic ideas can be shared by people on the Internet.

Corporate knowledge is mainly manifested through the knowledge of corporate employees. Corporate innovation is indivisible from team building, and team members constitute the important elements for the team-building process and innovations. As for

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China, it currently experiences rapid development of the knowledge-based economy, digital economy, and science and technology.

Organizational personnel increasingly presents the trend of diversification and differentiation. Certain differences are found in the growth of the internal members, the experience learned through academic education, and the relevant knowledge acquired at work. This knowledge difference thus shapes the knowledge heterogeneity. Upon abundant practical analysis, experts found that the employees' heterogeneity knowledge brings forth the heterogeneity of employee behavior and thinking, which may cause conflicts among employees. Despite the fact that such conflicts may trigger employees' negative emotions, they are also able to inspire employees to absorb, share and transfer knowledge so as to improve problem-solving and innovation abilities to some extent. In the meantime, China's independent scientific and technological innovation and R&D prowess remain weak. In order to further enhance the market competitiveness of enterprises under the "fast track" of technological development in China, it is necessary to support new development opportunities and more enriched long-term innovation and development space of companies with more fruitful products and R&D accomplishments. Compared with other enterprises, those who serve high-tech companies are mostly knowledge-based employees who are usually armed with higher personal qualities and abilities, can effectively self-manage themselves, and delve into creative thinking. They also demonstrate a stronger pursuit of accomplishments and are more concerned about the realization of their value. These team members from high-tech enterprises find it effortless to ceaselessly shape new knowledge and skills on the basis of the original pieces of knowledge and endeavor to contribute to the company itself and society at large.

At present, the agglomeration of high-skilled industries intensifies. Against this background, high-tech enterprises gather enormous capital, knowledge, technologies, and talent, which can inject a strong impetus into the innovation-driven strategy. A number of industry-leading enterprises facilitate their transformation and upgrades by strengthening teamwork and progressively promote corporate performance. It can be seen that the knowledge-based economy provides a continuous growth driver for corporate innovation. In the new round of scientific and technological revolution, technological advancement requires support from human capital, and the new circumstance proposes new requirements for corporate governance and human resource management as well, which is to say, how to relieve the stress endured by employees and improve their innovation performance in a fast-paced and high-stress environment, or how to effectively weigh the competency of the employees for this position, or how to ensure the sustainable and healthy development of the enterprise. Through literature review and analysis, it is found that the employees of high-tech enterprises will inevitably have significant role stress in their work, which may undermine the innovation performance of sustained innovation management. Due to the different degrees of heterogeneity within employees, varied degrees of role stress will be hindered respectively.

It is managers who make optimal decisions, which means that the lack of effective communication between members, and interpersonal alienation are detrimental to the mental health of employees, thus weakening work engagement. Additionally, when it comes to how to deal with the stress experienced by employees who take diversified

roles, how to improve their working mood and facilitate their overall innovation performance remain issues of urgency for managers to consider. In view of this, in the context of the Internet-based sharing economy, this paper is mainly composed based on the samples of employees from high-tech enterprises and intends to analyze the relationships between knowledge heterogeneity, role stress, and innovation performance, in order to support the enhancement of employees' innovation performance with certain theoretical references and practical guidance.

2 Theoretical Basis and Research Hypotheses

2.1 Knowledge Heterogeneity and Role Stress

Knowledge is an extensive and important collection of experience, information, values, and other content[1]. It is generally believed that it contains all inventions and discoveries, of which the most crucial content involves technology, behavior, management, and other aspects. Knowledge heterogeneity usually indicates that the universal internal subjective elements and external objective elements of individual life exhibit certain differences[2]. All knowledge is one-sided and practical, and traditions substantially vary in different environments and procedures, thus giving birth to the heterogeneity mentioned here[3]. Differences in individual experiences mean that their way of thinking and knowledge structure often differ in certain ways. In this study, knowledge heterogeneity is defined as limited by a myriad of factors such as individuals' educational experience, life experience, and work skills, and subsequently shows a particular degree of individual variation in knowledge and experience. The abovementioned knowledge and experience can considerably affect the realization of the team's goals. On the one hand, the difference is merely visible at the group level, highlighting the differences in the team assignments. The degree of distinction in heterogeneity between the most important individuals is fully manifested when performing the team's group task. In terms of the construction of knowledge heterogeneity, it mainly includes the following aspects: knowledge in close relation to tasks, such as professional skills and work experience; knowledge closely related to individuals' life concepts, such as hobbies and personal values. On the other hand, as supported by existing theories, knowledge heterogeneity can be divided into two parts: one is the heterogeneity of explicit knowledge which refers to the characteristics that can be intuitively presented, such as educational level and professional background, and the other is the heterogeneity of dark knowledge which favors individual knowledge skills and work experience.

Differences in educational background, knowledge, and experience among the members within the organization lead to knowledge heterogeneity, but this heterogeneity is different from the heterogeneity of demographic characteristics in that knowledge heterogeneity, a character embedded in individual members, gets insignificantly observed, while demographic heterogeneity is easily to observe, which makes the former a deep feature and the latter a surface feature. However, knowledge heterogeneity is more likely to influence team goal achievement than demographic characteristics. As each team member is influenced by education and learning from various domains of

knowledge, different ways of thinking are adopted among individuals and then considerable differences in treating and solving problems will be discovered[4]. Based on this, knowledge heterogeneity results in the heterogeneity of information interpretation, which will further lead to the heterogeneity of behavior and decision-making. Therefore, the multiple heterogeneities in behavior and decision-making resulting from knowledge heterogeneity can be found, which may incur inconsistent, diversified, and differentiated conflicts within the team organization.

Given the diversified causes of knowledge heterogeneity, different role stress is formed in practices. According to the information decision theory, teams with more heterogeneous resources get access to more resources and information, and team members will undertake multiple roles to maximize the use of members' knowledge resources to better serve corporate decision-making. From this dimension, knowledge heterogeneity can be divided into subject heterogeneity and object heterogeneity, of which the former refers to individuals' knowledge heterogeneity, while the latter refers to information heterogeneity[5]. In terms of subject heterogeneity, due to the different knowledge and abilities of different members, a higher heterogeneity causes more fierce perceived competition among the members, and a higher likelihood to exert stress on themselves. Therefore, it is believed that the improvement of knowledge heterogeneity may bring stronger role stress to team members in companies.

H1: A positive correlation between knowledge heterogeneity and role stress exists. A higher degree of knowledge heterogeneity means more intense role stress that employees shall bear.

In terms of subject heterogeneity, out of the varied individual emotions and cognition, different roles will be established to perform different activities in their organizational behavior. Existing literature points out that demographic characteristics trigger surface role conflicts, and it is possible that differences in knowledge and opinions deepen the bias caused by differences in demographic characteristics. In particular, under the influence of individual self-esteem and internal drive for excellence, team members often believe that they acquire a relatively sufficient knowledge reserve, and their knowledge mastery outperforms that of others. Especially with the increasing heterogeneity of team members' knowledge, the sense of identity between members decreases in a progressive manner, breaking apart the social network that may have been formed by the same type of knowledge. Therefore, driven by the psychological influence of self-esteem, strengthening knowledge heterogeneity is likely to arouse conflicts among the roles of different members.

H1a: Knowledge heterogeneity is positively correlated to role conflict. A higher degree of knowledge heterogeneity leads to a higher possibility of conflict among employees.

Building a team with heterogenous employees intends to improve corporate performance or to deliver team goals, which is a decision or behavior process formed under the consideration of the team as a whole. However, the existence of knowledge heterogeneity among team members, the disposal of problems in different professional fields, thinking modes, and levels of members have shaped heterogeneity, resulting in a multi-role load and the risk of disagreement. Furthermore, the existence of member-level heterogeneity further exacerbates the difficulty of knowledge transfer and sharing, and the

dual nature of knowledge heterogeneity and a higher barrier increase the difficulty of understanding among members. In addition, even in the same field of expertise, the mastery and understanding of knowledge of members differ, and members solve problems out of professional differences, further generating the role load[6]. Therefore, the following assumption is made:

H1b: The knowledge heterogeneity and role load are positively correlated. A higher degree of knowledge heterogeneity makes a higher role load that employees will bear.

Most of the existing studies on role ambiguity tend to focus on the heterogeneity of demographic characteristics of team members. Li et al. (2015) believe that the differences in demographic characteristics of organization members in terms of age, gender, and other aspects cause role ambiguity[6]. The differences in individual demographic characteristics of team members lead to the construction of different social groups within the organization. Most members tend to share more information among their social groups, but less often span across different social groups. Moreover, in order to sustain personal social networks, members are often reluctant to share knowledge with others outside the network, bringing a higher overall communication cost within the organization, and even resulting in a wide gap between some social groups. With the advancement of knowledge heterogeneity, some scholars have explored the knowledge-based fuzzy role, pointing out that the adaptability of members is often inert and long-term[7]. Team members are able to multitask as their skills improve, but due to knowledge inertia and adaptability, they often work on similar tasks or capable team members just flawlessly perform similar tasks. But as knowledge heterogeneity intensifies, according to the information decision theory, heterogeneity resources often bring forth heterogeneity knowledge or information, meaning that only a certain type of knowledge-based members may not be able to understand various types of knowledge at the same time and this causes a poor understanding of their role in the particular task, which is also illustrated in the information processing theory. Therefore, the following hypothesis is made:

H1c: Knowledge heterogeneity is positively correlated to role ambiguity. A higher degree of knowledge heterogeneity leads to the stronger ambiguity of employees' role cognition.

2.2 Role Stress and Innovation Performance

When analyzing the relationship between role stress and innovation performance, it is found that role stress may reduce employees' innovation performance. According to the stress formation mechanism described in the resource conservation theory at the later stage, the heterogeneity degree of employee resources gets partially consumed due to the demand for work, which will generate unnecessary costs and work stress. Stress often triggers negative emotions or reluctant work attitudes. Under the influence of role stress, employees fail to effectively unleash their own creativity. Therefore, hypothesis 2 is proposed followingly.

H2: Role stress is negatively correlated to innovation performance. Employees contribute to lower innovation performance if they bear higher role stress.

Different forms of role stress may influence innovation performance from a range of perspectives. First of all, since role conflict is accompanied by the knowledge heterogeneity, experience, or thinking of members, it tends to produce differences among members, which can help with breaking the fixed way of thinking and improving the new cognition of team members on tasks[8]. In addition, the concept discussion among team members to alleviate conflicts is helpful in promoting the sharing, integration, and reconstruction of knowledge, and fueling the shift of knowledge from a quantitative to a qualitative state among organizational members. In this case, novel innovation is more likely to arise. Finally, in the process of knowledge sharing as a result of role conflict alleviation, knowledge often flows from the party with high reserves to the one with low reserves. Out of the sense of competition or elimination, this often encourages the latter to learn and thus leads to innovation. Therefore, hypothesis 2a is put forward.

H2a: Role conflict is positively correlated with innovation performance. The more intense role conflict between employees contributes to higher innovation performance.

Role load is derived from the role stress of team members. In general terms, members possess a certain ability to deal with stress, but when the role stress exceeds the stress tolerance ability, members experience role load as a result. According to the theory of social information processing, psychological perception and behavior trends of employees are often directly and closely related to the work situation and all kinds of social information obtained from it, and its processing strictly follows the reaction paradigm of information, perception, behavior, and output[9]. This psychological perception and behavioral response, as often as not, go through a series of processes, which shall finally shape a harmonious atmosphere within the team and enhance the output delivered by team behavior. At the same time, it can also show how team members process and respond to social information based on this result. But at the same time, if employees undertake too many roles, or cope with tasks beyond their ability, then it is likely to cause their inability to process information in an accurate way, leading to information confusion. Accordingly, hypothesis 2b is raised.

H2b: Role load is negatively correlated to innovation performance. A greater role load of employees results in their lower innovation performance.

Due to the heterogeneity of demographic characteristics and knowledge, role ambiguity occurs among the team members. However, the existence of fuzzy roles builds up a heterogeneous social network. Within the network, each member can share or transfer knowledge but may also come up with divergent opinions due to heterogeneity of knowledge or thinking, which often increases the difficulty of communication among team members[10]. In addition, team members are constantly unwilling to communicate or understand, mostly act based on their own perspective, and even tend to neglect the significance of addressing problems from the perspective of the overall team objective. Therefore, as influenced by such ambiguous roles, on the one hand, it will incur a higher communication cost, and many members resist communication or knowledge sharing. On the other hand, overall cooperation and coordination will decline, which consumes extra time and cost to deal with all opinions, and the core team members shall be undermined and the intention of innovation knowledge gets weakened[11]. Based on this, the following assumption is made:

H2c: Role ambiguity is negatively correlated to role and innovation performance. A vaguer employee's cognition of the role results in lower innovation performance.

2.3 Knowledge Heterogeneity and Innovation Performance

As for the relationship between knowledge heterogeneity and employees' innovation performance, most foreign studies believe in the existence of such a correlation. Bantel et al. stated that the heterogeneity of technical ability plays a positive effect on the administrative innovation ability of banks, and the difference in individuals' professional backgrounds also significantly contributes to the designing of the bank strategy. This paper provides preliminary practical evidence for the in-depth research of employees' innovation performance and mainly targets the banking industry[12]. According to other studies, the heterogeneities of the team, education, functional background, and other aspects shall play a corresponding role in promoting organizational innovation performance. Supported by the professional background and technical ability of members, the team provides a sufficient knowledge reserve for ensuring the valuable perspective and depth of the development strategy of the internal and external environment and the organization itself. In addition, inconsistent views and problem-solving methods support team members with possible opportunities to learn from each other. Wiersema et al. illustrated that the degree of heterogeneity in professionalism has a positive impact on changing how a team strategy is designed, which is mainly reflected in the impact on organizational performance[13]. Rodan et al. put forward the argument that knowledge heterogeneity significantly influences overall team performance[14]. Bouncken conducted theoretical research and concluded that the basic circumstances for team innovation performance are the knowledge heterogeneity of team members, diversified information sources, and multifaceted knowledge reserve[15]。

Domestic scholars have also performed relevant studies, pointing out that the positive role of employees' innovation performance is affected by the heterogeneity of academic and professional backgrounds, and other aspects[16-17]. A more enriched knowledge reserve and experience shall make a deeper problem. Mo et al. found that heterogeneity in education and technical ability is highly beneficial to the improvement of decision-making quality and efficiency. Further, employee innovation performance can be upgraded. Further research noted that the role of heterogeneity in team education in the performance of entrepreneurial teams is performed with the help of two perspectives: first, educational heterogeneity can provide diversified information, and encourage team members to deeply comprehend the circumstance and problems, thus improving their innovation performance; second, due to the heterogeneity of the members' professional experience, and the inconsistent opinion, in face of the same problem, different cognitive levels may emerge, and different professional experience will lead to a less satisfied employee performance[18]. In addition, relevant studies show that task-related heterogeneity such as industry experience and functional experience will positively contribute to enterprise performance. Teams with high-level and diversified educational backgrounds are capable of analyzing problems from multiple angles, so as to explore a more stable corporate growth path and strengthen corporate innovation[19].

Despite the abundant and in-depth academic research, no unified understanding of the relationships between knowledge heterogeneity and innovation performance as well as the action mechanism between the two factors have been reached yet. Some scholars believe that knowledge heterogeneity in the team helps optimize innovation performance, while others point out that the two factors present a negative relationship indeed, which is due to the fact that the differences in educational background and professional experience make the information sources of team members differ, and each member develops their own characteristics in cognition and perception of problems. Chances are that communication obstruction, conflicts, and the act of hurting team cohesion may ultimately undermine the innovation performance of employees. This paper holds the view that the basic contexts for innovative work must include the difference in personnel composition, the diversity of ideas, and knowledge heterogeneity. According to the information decision theory and information processing theory, heterogeneous resources usually contain heterogeneous information and knowledge, and based on the analysis and processing of diversified resources, it is helpful to improve the creative capability of employees.

In general, three ways to influence how knowledge heterogeneity impacts the innovation performance of employees are proposed in this paper: first, knowledge heterogeneity leads to breaking the fixed experience and ways of thinking and introducing new ideas; second, knowledge sharing deepens the knowledge integration, and reconstruct the existing knowledge base to shape novel ideas; and third, knowledge flows to encourage members to learn, strengthen the existing knowledge reserve and add new knowledge input. Under the influence of the three paths, team members alleviate conflicts with knowledge sharing and transmission, and stimulate new thinking[20]. Based on this, the following assumption is made:

H3: Knowledge heterogeneity positively affects innovation performance. A higher degree of knowledge heterogeneity leads to higher innovation performance of employees.

2.4 The Intermediary Role of Role Stress

As pointed out above, due to the different causes of knowledge heterogeneity, different sorts of role stress get shaped in practice. According to the information decision theory, teams with more heterogeneous resources also are home to more available resources and information, and team members undertake multiple roles to fully leverage members' knowledge resources to better serve corporate decision-making. From this perspective, knowledge heterogeneity can be divided into subject heterogeneity and object heterogeneity, the former being knowledge individual heterogeneity while the latter being information heterogeneity[21]. In terms of subject heterogeneity, various knowledge and abilities of different members mean that a greater heterogeneity cause a greater perceived competition of the members, and a higher likelihood to exert stress on themselves. In brief, strengthening knowledge heterogeneity puts role stress on team members.

The increase in role stress may lead to a decline in their work capability. But at the same time, according to the theory of resource conservation, the heterogeneity of employee resources will cause partial consumption due to the demand for work, which will lead to unnecessary costs and work stress. In this case, managers often build stress management and guidance platforms upon evaluating the members' abilities, and further optimize the human resource management system. The system, on the one hand, helps to increase the work resources and better enables employees to effectively cope with work stress. On the other hand, it heightens the efficiency of overall team governance. When the stress on employees decreases, their working ability gets upgraded. On the one side, effective team management helps team members relieve stress, adopt a positive working attitude, optimize the ability distribution of employees, and strengthen the overall ability of the team. Therefore, although knowledge heterogeneity may bring negative emotions to role stress, the organization will not sit still but take various measures to avoid or solve, and organizational effective management is likely to support more employees troubled by negative emotions, eventually inspiring higher innovation abilities. Therefore, it is hypothesized that:

H4: Role stress plays a positive mediating role in how knowledge heterogeneity affects innovation performance.

The theory of social information processing points out that a person refers to the role in the organization, while the task refers to the plot in the organization. In this respect, social interaction between the organization and the task is identified, which often processes the existing information and creates new information. At the same time, based on the theory of resource conservation, although individuals tend to keep their own knowledge to themselves, individuals will progressively share knowledge as influenced by the team atmosphere, especially in the case of substantial differences in knowledge, and the communication and interaction among individuals will gradually increase as well. At this point, knowledge heterogeneity shall cause role conflict. This is because on the one hand, strengthened individual knowledge heterogeneity may make the actual role and cognitive role differ, affecting the performance and thus generating role conflict. On the other hand, in knowledge heterogeneity between members, team members tend to define their knowledge reserve as being more sufficient and more enriched than others. The gradual decrease in the number of people with diverse identities among the members can lead to the breakdown of the social network that may have been formed based on shared knowledge. This can result in a conflict of roles within the group.

From the perspective of the organization, when faced with the same task, employees develop their own understanding and design their own role concept, while leaders may also require employees to perform certain tasks according to a specific role. To satisfy their own and leaders' requirements, employees shall deal with multiple role choices at work and in their life. However, due to the motivation and needs of role selection, employees cannot choose roles in a general manner or deal with multiple roles smoothly, resulting in role conflicts. Therefore, it will impose a significant negative impact on employees' subjective initiative to participate in work, and even weaken their emotional resources, making it difficult to effectively respond to the requirements of all parties. In this state, employees will inevitably care little about their work, with their motivation for innovation being reduced. However, at the same time, the role conflict between

employees can also promote the learning, sharing, and transmission of one another's knowledge, and further facilitate employees' innovation ability. Katz et al. conducted an empirical test of the relationship between role conflict and corporate performance, indicating that although theoretically speaking, role conflict considerably delivers negative results at work, actual data indicate that role conflict will introduce innovations[22]. In conclusion, the following hypothesis is proposed:

H4a: Role conflict has a positive mediating role in the process of knowledge heterogeneity affecting innovation performance.

The resource preservation theory states that a person's ability should be consistent with his or her expectations or the requirements from the outside world, otherwise, it will produce stress. Within an organization, when organizational managers or role-givers expect too much of employees or assign too many roles to them, this leads to a situation in which employees often feel powerless and then experience the role load. As the knowledge heterogeneity of team members strengthens, heterogeneous knowledge will intensify the competition among members compared with the previous personnel allocation of knowledge heterogeneity, and encourage members to acquire new knowledge. Moreover, the existence of member-level heterogeneity further strengthens the difficulty of knowledge transfer and sharing, and the dual nature of knowledge heterogeneity and the high barrier increases the difficulty of understanding among members, further causing role load in members.

Wu et al. pointed out that when the employee himself or the outside world expects high of him or her, the employee will suffer from significant stress, and the formation of stress may even make capable employees cast doubts on their ability, which even weakens their actual ability and makes them fail to effectively complete the work[23]. Perloweeks et al. showed in their study that if employees perform well, then their performance often exceeds expectations. If employees feel that they need to help others in addition to their respective tasks, then their stress often increases, and performance declines. If employees feel that the expectation for outcomes far exceeds their ability, then a gap emerges. And if they fail to complete the task, then they are likely to suffer from depression and other negative emotions, which affect their work mood through both psychological and practical influences, and their innovation performance gets hurt. The following assumption is made accordingly:

H4b: Role load plays a negative mediating role when knowledge heterogeneity affects innovation performance.

Resource conservation theory points out that role stress is partly the result of the lack of resources for fulfilling relevant needs. The lack of resources is mainly due to the failure to ensure a clear and accurate description of the specific work scope and authority, as well as the lack of strong policy guidance for the specific behavior of employees. In addition, there is a lack of effective communication, feedback paths, performance evaluation criteria, etc. Huang et al. elucidated that if employees engage too much in the internal activities of the organization, then the inaccurate cognition of their own behavior and role behavior will result in role ambiguity[24]. And knowledge heterogeneity may further deteriorate the role cognitive ambiguity of employees. When the employees are over-engaged in the internal activities of the organization, if the knowledge

required for these activities is homogeneous, then members can process using their existing knowledge or experience, which will make role ambiguity less likely. However, if the knowledge is heterogeneous, then the activities that shall be performed beyond the ability of employees will further bring role ambiguity to employees because of the knowledge heterogeneity as they are not equipped with enough energy and appropriate knowledge to address problems.

Pierce et al. indicated that currently, a number of supervisors' behavior tendencies constitute employee behavior as one of the inherent behavior of the role[25]. That is to say, if employees receive too much heterogeneous knowledge, then they cannot flawlessly perform the role as required by the organization's manager because their cognition of the role is different from the organization's manager in terms of rules and roles. In this process, owing to cognitive and communication differences, employees cannot effectively complete their tasks, which further leads to self-doubts about their own abilities and then affects the corporate performance as a whole. In view of this, the following assumption is made:

H4c: Role ambiguity plays a negative mediating role in the process of how knowledge heterogeneity affects innovation performance.

3 Study Design and Methods

3.1 Study Samples

This paper takes some high-tech enterprises in Jiangsu, Zhejiang, and Shanghai as the main research subjects, encompassing a wide range of network communication, biopharmaceutical, financial services, and other industries. The questionnaire survey adopted the method of matching leaders with employees, in which the knowledge heterogeneity scale was filled in by the middle managers, while the role stress and innovation performance scales were filled in by the employees. The researchers explained the key variables involved in the questionnaire to the respondents during the questionnaire survey to avoid errors caused by the respondents' misunderstanding. The researchers also promised the respondents that all the survey data would be for academic research use only and would not disclose any personal privacy and opinions, so as to reduce the possibility of the respondents concealing their real thoughts due to social stress and other reasons. In addition, to ensure that the respondents were those who work as team members, in this study, the investigators sent questionnaires mainly through familiar relatives and friends and detailed the specific requirements for the respondents(Table 1). A total of 1200 questionnaires were distributed, of which 1094 were recovered, at a recovery rate of 91.17%. After incomplete answers and inconsistent questionnaires were excluded, 1058 valid questionnaires were obtained, with the effective rate of the questionnaire being 88.17%.

Table 1. Basic Information of Samples

Project	Option	Subtotal	Proportion
Sex	Male	521	49.24

	Female	537	50.76
Age	30	260	24.58
	31-40	281	26.56
	41-50	431	40.74
	Above 51	86	8.13
Marital status	Married	237	22.4
	Unmarried	454	42.91
	Separated	271	25.61
	Widowed	96	9.07
Record of formal schooling	Junior college and below	174	16.45
	Undergraduate	719	67.96
	Postgraduate	106	10.02
	Doctor	59	5.58
Work life	Within 1 year	128	12.1
	1-5 years	178	16.82
	6-10 years	60	5.67
	11-15 years	257	24.29
	16-20 years	239	22.59
	21 years and above	196	18.53
Post	Ordinary employees	669	63.23
	Grass-root director	269	25.43
	Middle management	73	6.9
	Top management	47	4.44

3.2 Measurement Tools

Knowledge heterogeneity. The scale was designed according to the views of Louadi ME (2008), Felin T (2007), Peter Karne (2012), and other scholars, including items such as "the educational background between the innovation subjects in your enterprise or organization", "the professional knowledge level between the innovation subjects in your enterprise or organization", etc. The Cronbach α coefficient was 0.891, which illustrated the internal consistency between the variables used in the study.

Role stress. The scale was mainly based on the views of Peterson and Li Chao and other scholars and was divided into three dimensions: role ambiguity, role conflict, and role load, covering 13 measurement items. The range of role conflict questions was 1~3, the range of role fuzzy questions was 4~8, and the range of role load questions was 9~13. The consistency tests were performed separately, and the obtained Cronbach α values were 0.76, 0.74, and 0.90, respectively, indicating that the questionnaire items were well-designed.

Innovative performance. Referring to the views of Janssen and other scholars, the scale contains nine items, such as "I often have some new ideas to improve my work" and "At work, I will try to find new working methods, techniques, and tools". The internal consistency coefficient was 0.909, indicating the reasonable nature of the overall item design.

4 Results Analysis

4.1 Descriptive Statistics

A specific descriptive statistical analysis of the above variables (Table 2), which includes minimum, maximum, and standard deviation, has been utilized to observe the overall data of the sample. According to the table data, the standard deviation of related variables such as knowledge heterogeneity, innovation performance, and role stress all reached the value of approximately 1, indicating the existence of a relatively concentrated overall data distribution, although non-obvious differences were identified between samples.

Table 2. Statistics

	Sample capacity	Minimum	Maximum	Mean	Standard Deviation
Innovative performance	1058	1.00	5.00	3.9035	1.0164
Knowledge heterogeneity	1058	1.00	5.00	3.8396	1.0408
Role stress	1058	1.00	4.69	3.7972	0.9815
Role conflict	1058	1.00	5.00	3.8444	1.1195
Character fuzzy	1058	1.00	5.00	3.8155	1.0892
Role load	1058	1.00	5.00	3.7507	1.1832

4.2 Correlation Analysis

Correlation analysis refers to a mainstream statistical method to study the existence of a correlation between things and their related multivariate, and the significance of the correlation between a number of variables, among which the type of correlation analysis between the two variables is known as linear correlation analysis. In this study, the Pearson correlation analysis was performed, whose results are shown in Table 3.

The results in the table show a positive correlation between innovation performance and knowledge heterogeneity, with a correlation coefficient of 0.243. A significant negative correlation between innovation performance and role stress, with a correlation coefficient of -0.063, was identified. A clear positive relationship between knowledge heterogeneity and role stress, with a correlation coefficient of 0.249, got discovered as well. To summarize the results of the relevant analysis, a measurement model was further established for the regression test to study the influence between the variables and the mediating role of role stress, so as to verify the research hypotheses of this paper.

Table 3. Correlation Analysis of the Variables

	Mean	Standard deviation	1	2	3	4	5	6	7
Work life	3.84	1.66	1						
Innovation Performance	3.90	1.02	-0.002	1					
Knowledge Heterogeneity	3.84	1.04	0.074*	0.243**	1				
Role stress	3.80	0.98	0.067*	-0.063*	0.249**	1			
Role conflict	3.84	1.12	0.093**	0.06	0.118**	0.807**	1		
Character fuzzy	3.82	1.09	0.033	-0.077*	0.177**	0.878**	0.613**	1	
Role load	3.75	1.18	0.06	-0.099**	0.307**	0.891**	0.609**	0.625**	1

4.3 Hypothesis Test

1. Main-effects test. According to the above analysis, role stress can be divided into role conflict, role ambiguity, and role load, and thus the knowledge heterogeneity and the above variable relationship were tested empirically and respectively, whose results are shown in Table 4.

Table 4. Knowledge Heterogeneity and Role Stress

	Role stress	Role conflict	Role load	Character fuzzy
Knowledge heterogeneity	0.188***	0.111***	0.306***	0.178***
	(6.089)	(3.621)	(10.386)	(5.844)
Sex	-0.006	0.001	0.007	-0.014
	(-0.859)	(0.028)	(0.238)	(0.468)
Educational status	-0.024	-0.016	0.033	0.050
	(-1.004)	(-0.496)	(1.068)	(1.558)
Work life	0.074**	0.090***	0.027	0.005
	(2.154)	(2.800)	(0.888)	(0.153)
Constant	2.210***	3.202***	2.202***	2.976***
	(6.240)	(15.901)	(10.769)	(15.294)
Adj-R^2	0.216	0.146	0.310	0.146
F price	15.547	5.746	28.082	5.746
	(0.000)	(0.000)	(0.000)	(0.000)

Note: brackets t value, *, * * *, and * * * indicate the significance levels of 10%, 5% and 1%, respectively.

As observed from Table 5, knowledge heterogeneity changed by 1%, and role stress changed by 0.188% and was significant at the 1% level, indicating positive effects of knowledge heterogeneity on role stress, as supported by hypothesis 1. Knowledge heterogeneity changed by 1% and role conflict changed by 0.111%, verifying hypothesis 1a. For corporate employees, once they are forced to show knowledge heterogeneity based on special circumstances, they both are required to work on their position and to play the role of a good colleague that they do not agree with, so it is particularly easy

for low mood to emerge. In reality, similar cases arise. To illustrate, when a member of an organization needs to finish an urgent work task, he or she may be reached out by a colleague who asks for help in the meantime. At this point, the employee can choose from two options: he or she either declines to help, resulting in the state of being considered unfriendly to and ignored by other colleagues; or he or she decides to offer help, which will postpone his or her completion of the task. Therefore, in cases where employees show knowledge heterogeneity, conflicts will arise in the process of performing different work roles.

Knowledge heterogeneity changed by 1%, and role ambiguity changed by 0.178% which was significant at the 1% level, thus verifying hypothesis 1b. Knowledge heterogeneity changed by 1%, role load changed by 0.306% and was significant at the 1% level, and hypothesis 1c was verified. Taking the above conclusions as a whole, when employees have to show knowledge heterogeneity, they not only need to play the role of their position but also need to undertake another role as a good colleague. For example, in daily work, in face of the voluntary overtime, or a work task beyond their responsibilities, employees tend to work overload. Therefore, from the perspective of theoretical and practical logic, this conclusion holds more reasonable ground.

Upon further examination of the relationship between role stress and innovation performance, results are shown in Table 7. Results in the table show a 1% change in role stress and a -0.105% change in innovation performance which was significant at the 1% level, supporting hypothesis 2. As for the employees of the high-tech enterprises that have been studied, a lack of necessary role information has been identified. In terms of position, the unobvious, accurate, and reasonable division of power will cause them bad emotions (such as stress, dissatisfaction, and anxiety), so the employees reduce their work input, and finally, their work efficiency is affected.

Despite the fact that role conflict positively affects innovation performance, the coefficient is not significant, and hypothesis 2a hasn't received empirical support. Role ambiguity and role load build significant negative relationships with innovation performance, with coefficients of -0.137 and -0.178, respectively, and were significant at 1%, indicating that role ambiguity changed by 1% and innovation performance by -0.137%, role load changed by 1%, and innovation performance changed by 0.178%, which meant hypothesis 2b and 2c were supported by empirical results, respectively.

Table 5. Role Stress and Innovation Performance

	Innovative performance	Innovative performance	Innovative performance	Innovative performance
Role stress	-0.105*** (-3.751)			
Role conflict		0.027 (1.128)		
Role load			-0.178*** (-5.847)	
Character fuzzy				-0.137*** (-4.926)
Sex	0.007 (0.347)	-0.008 (-0.533)	-0.013 (-0.675)	-0.014 (-0.802)

Educational status	0.008	-0.031	-0.071	-0.054
	(0.119)	(-0.571)	(-1.071)	(-0.915)
Work life	-0.038	-0.016	-0.020	-0.006
	(-1.087)	(-0.547)	(-0.550)	(-0.194)
Constant	0.126***	0.266***	0.243***	0.162***
	(7.910)	(10.892)	(10.911)	(10.387)
Adj-R^2	0.156	0.247	0.254	0.285
F price	13.724	12.144	15.665	18.947
	(0.000)	(0.000)	(0.000)	(0.000)

Note: brackets t value, *, * * *, and * * * indicate the significance levels of 10%, 5% and 1%, respectively.

Subsequently, the relationship between knowledge heterogeneity and innovation performance was empirically investigated according to formula (3), and the results are shown in Table 6. Based on the results of the regression analysis, the adjusted R2 value of 0.248 indicated that the model fit was acceptable, the value of F was 17.237, and the null hypothesis was rejected at the 1% level, indicating that the regression results were overall significantly valid. Under other conditions, knowledge heterogeneity increased by 1%, and innovation performance increased by 0.243% and was significant at the level of 1%, indicating that knowledge heterogeneity can indeed significantly promote innovation performance. Therefore, hypothesis 3 was verified. When employees show knowledge heterogeneity, they strengthen knowledge sharing and transmission and establish social network relations. The mutual incentives and risk of members in the social network help to enhance work enthusiasm and heighten emotional investment from the psychological level, and finally deliver innovation performance improvement.

Table 6. Knowledge Heterogeneity and Innovation Performance

	Innovative performance
Knowledge heterogeneity	0.243***
	(8.088)
Sex	-0.035*
	(-1.172)
Educational status	-0.027
	(-0.868)
Work life	-0.012
	(-0.368)
Constant	3.210***
	(17.932)
Adj-R^2	0.248
F price	17.237
	(0.000)

Note: brackets t value, *, * * *, and * * * indicate the significance levels of 10%, 5% and 1%, respectively.

2. Test of the Mediation Role of Role Stress. First, the coefficient c of knowledge heterogeneity as the independent variable on the dependent variable innovation performance was observed, whose value was 0.243 and significant at 1% level,

indicating an overall significant effect; as for knowledge heterogeneity as an independent variable on the intermediary variable role, the coefficient of stress was 0.188 and significant at the 1% level.

Table 7. Mediating Role of Role Stress

	Innovative performance	Role stress	Innovative performance
Knowledge heterogeneity	0.243***	0.188***	0.102**
	(8.088)	(6.089)	(2.071)
Role stress			0.069*
			(1.665)
Rex	-0.035*	-0.006	-0.015
	(-1.172)	(-0.859)	(-1.157)
Educational status	-0.027	-0.024	0.070
	(-0.868)	(-1.004)	(1.596)
Work life	-0.012	0.074**	0.004
	(-0.368)	(2.154)	(0.068)
Constant	3.210***	2.210***	2.069***
	(17.932)	(6.240)	(5.465)
Adj-R^2	0.185	0.216	0.258
F price	9.308	15.547	18.214
	(0.000)	(0.000)	(0.000)

Note: brackets t value, *, * * *, and * * * indicate the significance levels of 10%, 5% and 1%, respectively.

After incorporating knowledge heterogeneity as the independent variable, it was observed that the coefficient of intermediary variable role stress on the dependent variable innovation performance changed from negative to positive with a coefficient of 0.069 and was significant at the level of 10%, demonstrating that the coefficient ab was overall significant, and a significant indirect effect was found; and in the meanwhile, after adding the intermediary variable role stress, the direct effect of knowledge heterogeneity as the independent variable on the innovation performance of the dependent variable c'coefficient was 0.102 and significant at the 1% level, indicating the possible existence of other mediators. However, both ab and c ′ were positive in value, showcasing that role stress produces a partial positive mediation effect in the process of knowledge heterogeneity affecting innovation performance, which verifies hypothesis 4.

According to Table 8, the influence coefficient of the independent variable knowledge heterogeneity on the innovation performance of the dependent variables was 0.243 and significant at the 1% level, indicating a significant total effect. The coefficient of independent variable knowledge heterogeneity on the role conflict of intermediary variables was 0.111 and significant at the 1% level. The coefficient of the mediation variable role stress on the innovation performance of the dependent variable was 0.033 but insignificant, implying the necessity for the Bootstrap method to test the joint significance of ab. The confidence interval was [-0.241, 0.262] which contained 0, suggesting the insignificance of the indirect effect. The mediation effect of role conflict has not been supported by the empirical results, and thus hypothesis 4a wasn't tested.

Table 8. Intermediary Role of Role Conflict

	Innovative performance	Role conflict	Innovative performance
Knowledge heterogeneity	0.243*** (8.088)	0.111*** (3.621)	0.239*** (7.916)
Role conflict			0.033 (1.146)
Sex	-0.035 (-1.172)	0.001 (0.028)	-0.035 (-1.174)
Educational status	-0.027 (-0.868)	-0.016 (-0.496)	-0.027 (-0.851)
Work life	-0.012 (-0.368)	0.090*** (2.800)	-0.015 (-0.461)
Constant	3.210*** (17.932)	3.202*** (15.901)	3.113*** (15.618)
Adj-R^2	0.248	0.146	0.250
F price	17.237 (0.000)	5.746 (0.000)	14.036 (0.000)

Note: brackets t value, *, * * *, and * * * indicate the significance levels of 10%, 5% and 1%, respectively.

As seen from the empirical results of the mediation effect of the role load in Table 9, the coefficient of knowledge heterogeneity on innovation performance was 0.243; the coefficient of knowledge heterogeneity on the role load of the intermediary variable was 0.306 and significant at the 1% level; the coefficient of the intermediary variable was -0.190 and significant at the 1% level, meaning that the coefficient ab was all significant and an insignificant indirect effect was identified; and at the same time, after controlling for the effect of the intermediary variable role load, the direct effect of independent variable knowledge heterogeneity on the innovation performance of the dependent variable c'coefficient was 0.301 and significant at the 1% level, which indicates that other mediators may exist. However, ab and c'different signs suggest that role load produces a more masked mediation effect, verifying Hypothesis 4b.

Table 9. Mediation Role of Role Load

	Innovative performance	Role load	Innovative performance
Knowledge heterogeneity	0.243*** (8.088)	0.306*** (10.386)	0.301*** (9.709)
Role load			-0.190*** (-6.143)
Sex	-0.035* (-1.172)	0.007 (0.238)	-0.034 (-1.148)
Educational status	-0.027 (-0.868)	0.033 (1.068)	-0.021 (-0.680)
Work life	-0.012 (-0.368)	0.027 (0.888)	-0.006 (-0.206)
Constant	3.210*** (17.932)	2.202*** (10.769)	3.569*** (19.248)
Adj-R^2	0.185	0.310	0.307

F price	9.308 (0.000)	28.082 (0.000)	21.818 (0.000)

Note: brackets t value, *, * * *, and * * * indicate the significance levels of 10%, 5% and 1%, respectively.

Table 10. Mediator Role of Role Ambiguity

	Innovative performance	Character fuzzy	Innovative performance
Knowledge heterogeneity	0.243*** (8.088)	0.178*** (5.844)	0.264*** (8.740)
Character fuzzy			-0.123*** (-4.072)
Sex	-0.035** (-1.172)	-0.014 (0.468)	-0.037 (-1.240)
Educational status	-0.027 (-0.868)	0.050 (1.558)	-0.021 (-0.678)
Work life	-0.012 (-0.368)	0.005 (0.153)	-0.011 (-0.351)
Constant	3.210*** (17.932)	2.976*** (15.294)	3.551*** (18.076)
Adj-R^2	0.185	0.146	0.276
F price	9.308 (0.000)	5.746 (0.000)	17.310 (0.000)

Note: brackets t value, *, * * *, and * * * indicate the significance levels of 10%, 5% and 1%, respectively.

Table 10 shows the test results of the intermediary effect of role ambiguity. The coefficient of knowledge heterogeneity on innovation performance was 0.243; the coefficient of knowledge heterogeneity on the role of the intermediary variable was 0.178 and significant at 1%; the coefficient of the intermediary variable role ambiguity on the innovation performance of the dependent variable was -0.123 and significant at the 1% level, meaning the coefficient ab was all significant, and showing a significant indirect effect; and at the same time, after controlling for the effects of ambiguity in the role of the intermediary variables, the direct effect of the independent variable knowledge heterogeneity on the innovation performance of the dependent variable c'coefficient was 0.264 and significant at the 1% level, indicating that other mediators may exist. However, ab and c'different signs indicate the addition of character ambiguity. When covering up the impact of knowledge heterogeneity on innovation performance, role ambiguity was found to produce a masked mediation effect, verifying hypothesis 4c.

5 Research Conclusions and Discussion

5.1 Conclusions

In this paper, the relevant literature was first summed up and analyzed, then the theoretical analysis model got constructed, the questionnaire survey result was obtained,

and the statistical methods were used to analyze the specific relationship and action mechanism of knowledge heterogeneity, role stress, and innovation performance of team members in high-tech enterprises. Through theoretical analysis and empirical research, the following main conclusions are reached: (1) knowledge heterogeneity exerts a positive impact on role stress and significantly positive effects on role conflict, fuzzy, and load, showing that the knowledge heterogeneity knowledge, to a certain extent, can cause cognitive conflict, fuzzy and stress. (2) Role stress adversely impacts employees' innovation performance. Role conflict has an insignificant and positive impact on innovation performance, indicating that the collision of knowledge, experience, and behavior among members can stimulate new ideas though not in a strong manner. Both role ambiguity and role load negatively influence innovation performance, indicating that employees develop fuzzy cognition of role and the stress caused by role shall lead to poorer innovation ability. (3) Knowledge heterogeneity has a positive impact on employees' innovation performance. Strengthening employee knowledge heterogeneity helps to deliver more effective knowledge complementarity and communication among employees, which drives the improvement of employees' innovation performance. (4) Role stress plays a positive and partial intermediary role in the process of knowledge heterogeneity affecting innovation performance, indicating that knowledge heterogeneity not only directly promotes innovation performance, but also can stimulate innovation ability by bringing role stress to employees. However, role conflict plays an insignificant intermediary role, and role ambiguity and role load mainly produce the concealment effect.

5.2 Research Limitations and Prospects

Some innovations and breakthroughs have been studied in this paper though deficiencies and limitations still inevitably exist. The discussion of the relationship between variables in this paper is based on cross-sectional data, and it is suggested that future studies may employ time series data to conduct empirical analyses that make up for such a shortage. In empirical studies, subjective evaluation data can result in certain degrees of deviation out of subjective reasons. Due to the limitations of the research environment, process, and other conditions, this study used subjective evaluation data to measure knowledge heterogeneity and employee performance. However, it is possible that the subjective evaluation data deviate from the actual and objective performance data, and the results generated by this study hold somewhat. Additionally, the research model requires optimization as the mechanism model of knowledge heterogeneity on employee performance established in this study may overlook some important factors. In practice, variables such as organizational commitment and leadership type may also influence the relationship between collective psychological ownership and employee performance involved in this study. To supplement the insufficient analysis, follow-up studies can also be carried out from the following two aspects: first, expand the scope of regulatory variables or intermediary variables, and further study how the variables such as turnover intention and creativity influence knowledge heterogeneity, employee performance, and work attitude; and second, explore the leading variables of

knowledge heterogeneity and further analyze the causes of employees' knowledge heterogeneity.

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