Empirical research for the interactive memory system and the shared mental and knowledge transfer---Software outsourcing project team is the research of object

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Abstract. Aiming at China, which is developing rapidly to become the most promising outsourcing service in the world, this paper discusses how to improve the knowledge transfer of outsourcing contractor in the process of software outsourcing and improve the quality of software outsourcing project. This paper introduces interactive memory theory and shared mental theory to explain and study the effect of expertise cognition and common cognition on the knowledge transfer efficiency and knowledge transfer effect from the contractor to the subcontractor. By using the empirical research method, (1) The interactive memory system and the shared mental model have a significant positive effect on knowledge transfer efficiency and knowledge transfer effect. (2) The interactive memory system can significantly affect the role of knowledge transfer. Efficiency, shared mental model can affect knowledge transfer efficiency and knowledge transfer effect.

1. Introduction

Economic globalization and industrial refinement of the international context, the rapid development of software outsourcing industry has gradually become the international software industry, the new trend of development and growth. In the process of software outsourcing, the knowledge transfer from the contracting party to the receiving side, the knowledge transfer process is to undertake the successful completion of the project is one of the key factors, but also China's development andexpansion of the opportunity to receive business. After years of scientific research, domestic and foreign scholars have formed mature research ideas. Depth research, but mostly in accordance with the knowledge transfer of research ideas, from the software project team members of the work characteristics of the extension of the basic points of the research less. This study is based on the above characteristics of software project team members' work and outsourcing project tasks. The purpose of this study is to explore the influence and mechanism of cognition on the software outsourcing process, and introduce the interactive memory theory (TMS) of cognitive psychology and shared mental theory (SMM) to explain how the team members' knowledge and common knowledge influence the knowledge transfer of the software outsourcing project team, and put forward the research model which affects the knowledge transfer of the software outsourcing project team through cognitive, in-depth, normative and scientific theoretical analysis and demonstration.This paper studies the impact mechanism of knowledge on the efficiency of knowledge transfer and the effect of knowledge cognition on software outsourcing project process, and obtains empirical research results.

2. Literature Review

2.1 Interactive Memory System Theory

Transactive memory systems (TMS) is a cooperative division system that acquires, stores, and utilizes information from different domains. Wegner's memory of small groups of intimate partners, such as couples, found that team members can also share the memory of other members with their foreign counterparts by communicating with other intimate partners about their areas of expertise.The process of using other people's memory is called the interactive memory process, and each team member's interactive memory process evolves to form an interactive memory system.

For the study of how TMS is applied in the team, the domestic and foreign scholars use general team and knowledge-intensive team as the research object respectively.The research of interactive memory system theory in software outsourcing field is still few. Based on the empirical study of 25 software outsourcing enterprises in Dalian, Qu Gang and Li Bosen have shown that TMS can promote the information communication and knowledge acquisition in the field of software outsourcing. Affect the software outsourcing outsourcing direction of knowledge transfer.

2.2 Shared Mind Model Theory

The shared mental models were developed based on the mental model, and were first introduced by Cannon-Bowers and Salas. They are team members who share a common understanding of team tasks, task contexts, strategies, member interactions, and member characteristics. knowledge structure. Because team members have common knowledge, they can correctly understand the team tasks and accurately predict the behavior of other members, reducing the misunderstanding among members, coordinating the behavior of individuals and teams to better adapt to team tasks and other team members.Most scholars extend the application of shared mental models to team performance such as team performance, team effectiveness, knowledge transfer and knowledge sharing. Espinosa believes that shared, overlapping team knowledge (mission objectives, strategies, processes, team interaction, etc.) that members of a team have in the process of developing a geographically dispersed software project can facilitate behavioral co-ordination , To help the new knowledge to better transfer between member.

2.3 Research on Knowledge Transfer Efficiency of Software Outs

Szulanski argues that knowledge transfer refers to the process of information transmission from the source unit of knowledge to the unit of acceptance in certain contexts; the recipients of knowledge transform them into understandable knowledge after absorbing the knowledge they did not know before , And merged into their existing knowledge base, the absorption of knowledge will enable individuals or organizations to further improve the capacity in order to achieve better performance in various activities. Knowledge transfer efficiency refers to the expectation or perception of the efficiency of knowledge transfer in the knowledge transfer process of team members. The knowledge transfer in this study mainly refers to the unidirectional transfer of the knowledge of the contracting party members in the outsourcing project team, including knowledge transfer efficiency and knowledge transfer effect. The efficiency of knowledge transfer focuses on software outsourcing The expectations and perceptions of the knowledge efficiency of the transfer from the employer.

The knowledge transfer in the process of software outsourcing is the process of knowledge sharing between the employer and the receiver in the aspects of technical knowledge, management system, process control and so on. In this paper, based on the characteristics of the cognitive interaction of team members, this paper puts forward the theory of interaction memory and shared mental model to study outsourcing outsourcing team members' specialization and sharing cognition. On the other hand, The one-way knowledge transfer effect.

3. Research models and assumption

The dimensions of the shared mental model are measured from the task-based mental models and the team-based mental models, with reference to Cannon-Bowers and Mathieu et al. From the aspects of knowledge transfer efficiency and knowledge transfer efficiency, the knowledge transfer efficiency is measured from the speed, reliability and accuracy of knowledge transfer from the aspects of software design and development capability, information technology application ability, project management ability, Contract management capabilities and other aspects of measurement of knowledge transfer effect.

(1) interactive memory system

According to Lewis and other scholars on the interactive memory system of mature research ideas, this study from the expertise, credibility and collaboration of three aspects of its knowledge transfer efficiency and knowledge transfer of the effect.

Expertise consists of two parts, one part of the members have some expertise in the degree of expertise; the other part of the members of the other members know the extent of the areas of expertise, but do not need to specifically understand the field of knowledge. Expert knowledge is the basis of team interaction, and TMS team members will gradually become experts in different fields.

Credibility is the degree to which team members trust each others knowledge and information. Membership expertise is the basis for interactive behavior, and trustworthiness is the decisive factor in how TMS really functions. In a highly efficient and experienced team, the members can trust and accept the opinions and suggestions of other experts and cooperate with each other to complete the task.Collaboration refers to the degree to which team members fully integrate and utilize each other's expertise. Kanawattanachai argues that it is not enough to know and trust the expertise of team members, and that members must have the expertise to collaborate, which directly affects the effects of interactions. It is assumed that:

H1: The interactive memory system of the software outsourcing team is positively related to the knowledge transfer efficiency;

H2: The interactive memory system of the software outsourcing team is positively related to the knowledge transfer effect;

(2) shared mental model

① Task-based shared mental model

Task-based shared mental model refers to the team members on the team task objectives, processes, strategies, tasks, such as the consistency of cognitive context. The consensus on the software outsourcing project can reduce the misunderstanding in the work, promote the cooperation between the contractor and the contractor, and influence the project completion progress and project quality. ② based on the team shared mental model

The team-based shared mental model refers to the consistent cognition of the interrelatedness of the behavior of team members. Team-based coherence awareness is important for software outsourcing projects, and contractors often need to communicate with the contractor, discuss task requirements, business requirements, project progress, etc. in a timely and accurate manner. Party decision-making, work habits, the work of the employer's requirements and how to coordinate with the employer, so as to be able to end outsourcing project tasks to obtain the employer's approval to promote the transfer of knowledge, learning to the employer's advanced management knowledge, Improve the effect of knowledge transfer, so the hypothesis:

H3: Shared mental model of software outsourcing team is positively related to knowledge transfer efficiency;

H4: The shared mental model of the software outsourcing team is positively related to the knowledge transfer effect;

4. Research Design

The authorto Beijing and Dalian Software Park area in the software outsourcing project team to issue questionnaires, and the project manager as the main respondents to ensure the quality of the questionnaire. A total of 90 questionnaires were distributed, and 85 valid questionnaires were retrieved. The effective recovery rate was 94.4%.

In this study, the Likert 5-point scale was adopted. The measurement scales were divided into independent variables (interactive memory system, shared mental models) and dependent variables (knowledge transfer efficiency, knowledge transfer effect).

(1) independent variables: interactive memory system measurement

Studied the scale, based on the situation of software outsourcing on Lewis initial scale for individual words to modify, and streamlining the Zhang the data results are not ideal The final scale was composed of 12 items, including specialty (6 items), credibility (3 items), and cooperation (3 items).

(2) Independent variables: shared mental model measurements

Based on the shared mental models of Cannon-Bowers and Salas , Mathieu breaks down the team-shared mental models into task-based and team-based shared mental models. The two dimensions of the shared mental model (based on task and team member behavior) were compiled. Based on Cannon-Bowers and Mathieu's model of shared mental models, the questionnaires were divided into two dimensions: project-related and team-related shared mental models. Among them, the project-related dimension is the team members on the team project goals, processes, strategies, situations and other common awareness. Team-related dimension refers to a common understanding of the interrelatedness of team member behavior.

(3) dependent variable: knowledge transfer efficiency

This study is based on Syed-Ikhsan et al. The study is based on the real cooperation team in Malaysia. The research on the knowledge transfer metrics of knowledge transfer The transfer efficiency is measured from three dimensions (speed, reliability, accuracy). On the basis of this study, the individual items are modified, and the items are dealt with by software outsourcing to get the knowledge transfer efficiency.

(4) dependent variable: knowledge transfer effect

Based on the study of foreign contractors' performance, knowledge transfer literature and Dalian outsourcing enterprises, the author makes reference to domestic and foreign scholars Jun , Mao, Parolia and Palvia The knowledge transfer effect is the learning performance of the project of the receiver and the receiver. Through the completion of the software outsourcing project, the software design and development capability, the information technology application ability, the use of the information technology talent, the project management ability and the contract management ability, So you can use these items to measure knowledge transfer effect.

5. Analysis and discussion

In the present study, the Bootstrapping method of SmartPLS2.0 software is used to summarize the results of model hypothesis test, Table 5.6 is the hypothesis test results of the model, in which the test value of T values in 1.96,2.57 and 3.03 three criteria, indicating that the significance of different levels, the table shows, H1, H3 and H4 have been significantly supported, and the standard error (Standard Error), indicating that the model path coefficient is more accurate.

Table 1. Hypothesis Testing Results

Assumptions	path	Path coefficient	Tvalue	Standard deviation	in conclusion
H1	Interactive memory system → knowledge transfer efficiency	0.375	3.598	0.1227	found
H2	Interactive memory system → knowledge transfer effect	0.179	1.210	0.1371	invalid
H3	Shared mental model → knowledge transfer efficiency	0.412	3.210	0.1132	found
H4	Shared mental model → knowledge transfer effect	0.341	2.599	0.1301	found

(1) the knowledge transfer efficiency of the software outsourcing process empirical results

Suppose that H1 and H3 are supported, that is, for the knowledge-intensive software outsourcing project team, the knowledge of members' specialization and the cognition of commonness significantly affect knowledge transfer efficiency. In fact, it is not difficult to understand this conclusion, interactive memory system is based on the expertise of members to play the role of cognitive interaction, cognitive division of expertise is a cooperative system, the software outsourcing team members through the expertise of the interactive process of knowledge will promote knowledge From the knowledge source to the receiver to transfer, shorten the time of expertise knowledge interaction, thus speeding up the transfer of knowledge, improve the accuracy of knowledge transfer, and ultimately promote knowledge transfer efficiency. For the common cognition, the team-shared mental models promote team-based cohesion based on team and task cognition, reduce the error of consistency cognition, shorten communication time and speed up cooperation efficiency, and thus contribute to knowledge transfer The accuracy and reliability of cognitive cooperation to minimize the error, and ultimately promote the efficiency of knowledge transfer.

(2) The results of knowledge transfer in software outsourcing process

Assuming that H2 does not hold, the degree of influence of knowledge on knowledge transfer effect is not as large as expected. The possible explanation for the non-established H2 is that due to the competitive pressure of the external environment and the time pressure of the project completion, the receiver does not consider too much about the information or knowledge provided by the contractor, but chooses to use the expertise provided by the employer Knowledge is not enough time for in-depth learning, but only rapid knowledge transfer occurs, that is, the more decentralized knowledge of the expertise of outsourcing members and the more significant the interaction of expertise , The more conducive to promoting the efficiency of knowledge transfer, and on improving the project management capacity of contractors, contract management capabilities, and promote core business, information technology applications, such as the impact of income is not great. The hypothesis of H4 proves our hypothesis that task-based and team-based cognition can promote the effect of knowledge transfer (the learning performance of the recipient project), which is explained by the contractor's long-term project with the employer Cooperation experience, and gradually learn to the contracting party outsourcing project on the mission objectives, strategies, work habits, team interaction, such as the successful experience, and it is these outstanding successful experience significantly promote the packet in the software design and development capabilities, information technology applications Ability, project management ability, contract management ability and so on.

6. Conclusion and suggestion

In this paper, we use the structural equation modeling of partial least-squares method to analyze the causal relationship between the variables of the whole software outsourcing enterprises in Beijing and Dalian. The results show that the interactive memory system only has a significant effect on the efficiency of knowledge transfer, and the effect on knowledge transfer is not significant. Assuming

that H2 does not hold, the shared mental model has a significant effect on knowledge transfer efficiency and knowledge transfer effect.

The results of this paper have some reference value for the related theory and practice of the software outsourcing project team. Most of the scholars focus on the issue of outsourcing knowledge transfer from four perspectives: the employer, the receiver, the situation, and the relationship between the two sides. In this study, based on the detailed analysis of the characteristics of the outsourcing project and the characteristics of the outsourcing project team members, The team's own special cognitive mechanism, the team's cognitive perspective of knowledge transfer efficiency and knowledge transfer effect of research issues, expanding the existing research perspective, for the new understanding of cognitive theory in the outsourcing project team to provide a point It expands the development and application of the theory of interactive memory system and the theory of shared mental model in the software outsourcing project team, and gives a new way of thinking on the knowledge transfer problem of software outsourcing process.

In this study, there are still shortcomings to be studied in this paper. First of all, this study mainly uses the interactive memory system and shared mental model as a cognitive tool to explain the role of member expertise and common cognition in software outsourcing, but does not analyze in detail how to form, its influencing factors, etc. Secondly, Finally, it is necessary to further consider the effect of member cognition on the different stages of the project. In the end, it is necessary to consider the role of the cognitive model in the different stages of the project, Such as whether the impact of the early, mid, or late phases of the project is different.

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