The Influence of human capital, social capital and psychological capital on effectiveness of university students' research teams

Ke Jianglin, Ding Qun

School of Government, Beijing Normal University, Beijing, P.R. China, 100875

Keywords: University students' research teams, Human capital, Social capital, Psychological capital, Team effectiveness

Abstract: At present, university students' research teams have become an important subject in the innovative behavior of universities. Researching independently in form of team not only help university students understand the research process, accumulate relevant knowledge and experience, but also become an important way for universities to produce high-quality research achievements. The output of high-quality research achievements cannot be separated from efficient team, so how to improve the effectiveness of university students' research teams and to enhance the overall research quality of university students has gradually become a major difficulty in the management of universities. This research starts from the perspective of three-dimensional capital and puts forward the theoretical hypothesis about influencing factors of the effectiveness of university students' research teams. A questionnaire survey is conducted with research team members of 20 universities and 307 valid questionnaires were collected. Through data analysis, we verify the positive influence of university students' research team's human capital, social capital and psychological capital on team effectiveness and explore the moderating role of psychological capital. Finally, according to the research results and the information obtained from the questionnaire survey and interviews, we summarize the development status of undergraduates' research teams in universities and put forward management suggestions, which makes this research have both theoretical and practical values.

1. Introduction

In the "Decision on Deepening Teaching Reform and Promoting Quality Education in an All-Round Way", the CPC Central Committee and the State Council pointed out: "Higher education should attach importance to cultivating the innovative ability, practical ability and entrepreneurship of university students and generally raise their humanistic quality and scientific quality." At present as a great way to cultivate the innovative ability and practical ability of university students, it is more and more important for universities and students to organize and participate researching projects. University students' research teams have become an important subject of innovative behavior in colleges and universities. Therefore, how to improve the effectiveness of research teams and thus to improve the quality of scientific research is becoming a hot issue in universities.

In recent years, the theories of human capital, social capital and psychological capital have been a hot topic of academic research and these capitals are considered to be important factors in improving work performance of teams and enhancing organizations' core competitiveness [1]. Human capital is often understood as knowledge, skills, and experience that individuals develop through education and training. This concept was first proposed by Adam Smith in his book The Wealth of Nations published in 1776. With the further development of human capital theory, Ottorino Chillemi proposed the concept of team human capital in 1997. He focused on the integrity of team human capital and the moral hazard of team members.[2] Social Capital originated from sociological research, which is a social network formed through human interactions. It is based on certain social or interpersonal relationships. It adopts certain culture as internal code of conduct and it aims at the common benefits of certain groups or organizations. The concept of psychological capital was put forward by Professor Seligman, the father of positive psychology in 2002. [3]Psychological capital is a positive psychological ability that can be measured, developed, and has

  DOI: 10.25236/iseah.2018.068

a positive effect on job performance. The current empirical researches about human capital, social capital and psychological capital mostly put companies as research objects, which is relatively limited. Researches about the effects of three types of capital mostly focus on corporate performance and employee's occupational success, ignoring the key variable of team effectiveness.

As spontaneously formed knowledge-intensive organizations, overall knowledge, skills and experience, social relations and mental state of university students' research team members play a decisive role in whether scientific research activities can be carried out smoothly and whether the output of research results is of high quality. Therefore, from the perspective of three-dimensional capital, this study uses members of the university students' research team of 20 universities as a sample to conduct empirical research and to explore the influence of human capital, social capital, and psychological capital on team effectiveness.

2. Literature and hypothesis

2.1 Team effectiveness

Team effectiveness is the key to the success of companies. For the concept of team effectiveness, different scholars have different definitions. Goodman(1987) defines team effectiveness as a capability for teams to survive, adapt, maintain and develop.[4] Nadler, Hackman and Lawer (1979) believe that team effectiveness is the result of the team's final activities and can be evaluated from three aspects: production results, members' satisfaction and ability to continue cooperation.[5] Gladstein (1984) divides team effectiveness into two parts, performance and satisfaction. [6] Hackman (1987) points out that team effectiveness refers to actual results of the team's achievement about the predetermined goals. It mainly includes three aspects: (1) Performance standards about the output achieved by the team, such as individual performance and team performance; (2) The process developed by the team to improve team members' ability to work together, such as commitments, cohesion, etc.; (3) Whether team members' experience in team is satisfied, such as member satisfaction. [7] Based on above scholars' views, we refer to the definition of Gladstein (1984) and divides team effectiveness into two dimensions: team performance and member satisfaction. Team performance is actual results for the team to complete the research project. Member satisfaction is the team members' perception of the process and results of the research project.

2.2 Human capital and team effectiveness

As the capital condensed in individuals, human capital has been valued by various companies and has been proved to have a positive relationship with job performance in research. Ke Jianglin et al. (2010) found that human capital has a positive effect on job performance. [1] At the same time, Zhu Xi and other scholars (2013) showed that the human capital of the management team has significant influence on the company's performance. [8] Scholars such as Jiang Xiuzhen and Gu Qinxuan (2011) explained that team human capital significantly affects team innovation performance and plan compliance through learning from mistakes [9].

In this study, according to the characteristics of college students' research teams, we define team human capital as the team's knowledge acquisition and team's scientific research experience, and we divide it into three dimensions: knowledge breadth, knowledge depth and relevant experience. Knowledge breadth is represented by the heterogeneity and the range of team members' professional knowledge; knowledge depth is the level of professional knowledge of the entire team and relevant experience is the previous scientific research experience of the team as a whole. The team's human capital measures the team's knowledge and experience and is a prerequisite for team work. Teams with abundant human capital are more capable of doing well in the project and is more likely to show continuous enthusiasm for scientific research. According to above, we put forward the following hypothesis:

H1 Human capital of university students' research teams has positive effect on team effectiveness.

2.3 Social capital and team effectiveness

Social Capital originated in sociological studies. Putnam (1995) considered it to be some social organization characteristics that are conducive to coordination and cooperation in order to achieve common interests, such as networks, norms and social trust.[10] Ke Jianglin (2007) defined team social capital as a kind of resource exchange capability embedded in the social network among team members. And they considered that social capital is a social network formed through human interaction. It is based on a certain social or interpersonal relationship, uses a certain culture as an internal behavior norm and aims at common benefit of a certain organization. [11]

This study refer to the research of team social capital by Ke Jianglin et al. (2007), and define the social capital of university students' research teams as internal and external network relationships and the interpersonal interactions among team members. And it is divided into five dimensions: interaction intensity, network density, team trust, common language and common vision. Interaction intensity refer to the frequency of team members interacting through informal activities; network density refer to the average density of team members in consulting network, friendship network and communication network; member trust refer to the degree of trust in ability, benevolence, integrity and reliability of team members; common language refer to the degree to which team members communicate smoothly in terms of professional knowledge; common vision refer to the degree to which team members agree on team goals [12].

In the process of doing scientific research, university students' research teams not only need solidarity and effective cooperation among team members, but also need to establish and maintain a close social network relationship with the outside world to collaborate with different teams and organizations. By this way, they can get development opportunities, exchange information, knowledge and other resources and achieve complementary advantages. This kind of external network relationships, as well as internal trust and cohesion can be considered as teams' social capital. Therefore, the successful completion of a scientific research project is often inseparable from the favorable support of team social capital. To sum up, the following hypotheses were proposed:

H2 Social capital of university students' research teams has positive effect on team effectiveness.

2.4 Psychological capital and team effectiveness

Professor Seligman, father of positive psychology, proposed the concept of psychological capital in 2002, believing that psychological factors that lead to individual positive behaviors could be included in the category of capital. [3] On this basis, Fred Luthans, a famous organizational behaviorist and former President of the American academy of management, founded active organizational behavior (POB). [13] He proposed the third perspective of psychological capital that can reveal the source of organizational competitive advantage in 2004.[14] More and more scholars realized that psychological capital is as important as human capital and social capital, and it is a tool which can transform potential into practical ability (Jiang Jianwu, Zhao Shuming, 2007). [15]

In the field of human resource management, positive psychological factors such as self-efficacy (confidence), hope, optimism, happiness, emotional intelligence and resilience are the most representative. Luthans (2004) maintained that psychological capital refers to people's positive mental capacity and he listed four dimensions of confidence/self-efficacy, hope, optimism and resilience according to POB standards.[14] In 2005, Luthans et al. first defined psychological capital explicitly as core individual general positive psychological elements, embodied in the psychological state conforming to the standard of positive organizational behavior. They believed that psychological capital is beyond human capital and social capital, and enable individuals to gain competitive advantages through targeted investment and development [16].

The structure of team psychological capital can be summarized as team confidence, team hope, team resilience and team attribution which are relative to individual psychological capital in four dimensions. Team confidence refers to the degree of belief in abilities about stimulating motivation, using cognitive resources and executing operational planning when team doing tasks in a specific situation. Team hope refers to a positive, healthy and upward team status, which is based on

goal-oriented subjective initiative and sense of success. Team resilience, also known as the ability to bounce back and recover quickly. It frees the team from adversity and conflict, and is useful for problem solving when the team encounters major problems. Group attribution, also known as group optimism, refers to a causal attribution about the future. Teams with positive attributions are more likely to take responsibility and benefit more than those with negative attributions.

University students' research teams with high level of psychological capital have more positive atmosphere and psychological state, which enables team members to translate team knowledge, experience and capabilities into work output more fully, and it can also make communication within and outside the team smoother, thus enhancing the impact of human capital and social capital on team effectiveness. To sum up, the following hypotheses are proposed:

H3 Psychological capital of university students' research teams plays a moderating role in the influence of human capital and social capital on team effectiveness.

H3a With the improvement of psychological capital of university students' research teams, the influence of human capital on team effectiveness is enhanced.

H3b With the decrease of psychological capital of university students' research teams, the influence of social capital on team effectiveness is weakened.

3. Method

3.1 Sample

Participates came from 20 universities in Beijing which we selected randomly. A total of 370 questionnaires were issued and 307 were recovered, among which 269 were valid, with a recovery rate of 83.0% and an effective recovery rate of 72.7%. The specific distribution of the sample was as follows: 42.0% were male and 58.0% were female; the second-year students accounted for 56.9% and the third-year students accounted for 37.5%; key members of the research team accounted for 65.4%, and team leaders accounted for 34.6%.

3.2 Measures

Four variables (human capital, social capital, psychological capital and team effectiveness) and 42 related items in the questionnaire are determined. (1) Human capital. Different from the objective measures of human capital in enterprises, such as academic degree and working years, human capital of university students' research teams is more reflected in the heterogeneity of members' majors, the level of professional knowledge and scientific research experience. Therefore, this study divides human capital of university students' research teams into three dimensions: knowledge breadth, professional depth, and scientific research experience. Specific scale is based on the characteristics of university students' research teams, including three questions. The Cronbach 's alpha is 0.94. (2) Social capital. Combined the characteristics of university students' research teams, we modify the scale of social capital on corporate R&D team developed by Jianglin Ke et al. (2007) accordingly. [12]The revised scale has 5 dimensions including a total of 18 items. The overall Cronbach 's alpha of this scale is 0.92. (3) Psychological capital. Psychological capital is measured by the scale developed by Luthans and Youssef in 2005. [16]The scale has 3 dimensions and 12 items. The Cronbach 's alpha of this scale is 0.90. (4) Team effectiveness. A total of 8 items measuring 2 dimensions is modified according to the relevant scale of Wang's paper.[17] The Cronbach 's alpha of this scale is 0.89.

All items in this questionnaire adopt the 6 point Likert-style scale(0=fully disagree,1=disagree,2=a little disagree,3=a little agree,4=agree, 5=fully agree), and the overall reliability is good.

4. Results

4.1 Variables of descriptive statistics and correlation analysis

Mean, standard deviation and correlation of all variables are shown in Table 1. Gender, Scientific

research experience, Roles in teams and Research Project types are control variables. There was no abnormality in the mean and standard deviation of each variable. Grade has significant positive correlation with roles in teams and research project types. Scientific research experience is positively correlated with human capital. There was a significant positive correlation between the three types of capital. At the same time, there was a significant positive correlation between the three types of capital and team effectiveness.

Table 1 The mean, standard deviation, Pearson correlation coefficient of variables

	Mean	SD	1	2	3	4	5	6	7
1. Gender	1.580	.494							
2. Scientific research experience	2.350	.745	-.033						
3. Roles in teams	1.650	.476	.163**	-.146*					
4. Research Project types	1.880	.765	-.382**	.075	-.014				
5. Human capital	2.641	.79106	-.050	.159**	-.001	.065			
6. Social capital	3.667	.60066	.105	.006	.021	-.106	.320**		
7. Psychological capital	3.486	.57442	.084	.006	-.019	-.080	.409**	.731**	
8.Team effectiveness	3.658	.67693	.051	.059	-.066	-.110	.341**	.778**	.794**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.2 The direct influence of human capital and social capital

Model 1-3 in table 2 shows the influence of human capital and social capital on team effectiveness. The VIF of model 1-3 is less than the critical value of 10. The D-W value is significant at the 0.05 level which shows that the model does not have the serious problem of collinearity, and the analysis result of the model is acceptable. According to model 1, gender, scientific research experience, roles in teams and research project types do not have significant effect on team effectiveness. Model 2-3 show that the β of human capital and social capital are 0.394($p<0.001$) and 0.879($p<0.001$). Human capital and social capital of university students' research teams have significant positive effect on team effectiveness. Hypothesis 1 and 2 are tested.

Table 2 Regression analysis of three types of capitals on team effectiveness

	Model1	Model2	Model3	Model4
Control variables				
Gender	.030	.017	-.040	-.044
Grade	.052	-.008	.037	.046
Scientific research experience	-.088	-.069	-.086	-.056
Roles in teams	-.094	-.077	-.050	-.056
Independent variables				
human capital		.394***		
social capital			.879***	
psychological capital				.932***
R^2	.020	.292	.614	.639
ΔR^2	.020	.271	.594	.619
ΔF	1.339	98.823***	397.317***	441.862***

*, $p<0.05$; **, $p<0.01$; ***, $p<0.001$.

4.3 The moderating effect of psychological capital

Model 5-8 in table 3 shows the test results. The significance coefficient of the interaction term

between human capital and psychological capital is 0.113, much higher than 0.05, so the moderating effect of psychological capital on human capital and team effectiveness cannot be proved. Similarly, the significance coefficient of the interaction term between social capital and psychological capital is 0.200 which also fails to prove the existence of the moderating effect.

In order to further explore the influence of psychological capital on team effectiveness, we take psychological capital as an independent variable for regression analysis. Results are shown in table 3 model 4. The β of psychological capital is 0.932($p<0.001$), which shows that psychological capital of university students' research teams has significant positive effect on team effectiveness.

Table 3 Test of the moderating effect of psychological capital

	Model5	Model6		Model7	Model8
Control variables			Control variables		
Gender	-.040	-.028	Gender	-.053	-.048
Grade	.031	.027	Grade	.041	.037
Scientific research experience	-.054	-.060	Scientific research experience	-.067	-.073
Roles in teams	-.055	-.054	Roles in teams	-.046	-.042
Independent variables			Independent variables		
human capital	.105**	.116***	social capital	.481***	.472***
Moderator Variable			Moderator Variable		
psychological capital	.844***	.841***	psychological capital	.568***	.569***
Interactive variable			Interactive variable		
human capital×psychological capital		-.034	social capital×psychological capital		-.021
R^2	.652	.656	R^2	.722	.724
ΔR^2	.652	.003	ΔR^2	.722	.022
ΔF	80.405***	2.531	ΔF	111.272***	1.645

*, $p<0.05$; **, $p<0.01$; ***, $p<0.001$.

5. Discussion

The results show that human capital, social capital and psychological capital all have significant positive effects on team effectiveness, with explanatory power of 29.2%, 61.4% and 63.9% respectively. This is the same as the order of explanatory power of the three types of capital to task performance in the research of Ke Jianglin et al. [1] Contrary to expectations, psychological capital of university students' research teams has a direct and significant impact on team effectiveness, which is not realized through moderating effect. For college students with limited knowledge and experience, the scientific research task is highly innovative, analytical and challenging. In this process, members having confidence to complete the challenging work (confidence), to persevere with the target, choosing and adjusting proper methods to succeed (hope), having positive attribution to the present and future performance (attribution), and recovering quickly from difficulties and failures in order to obtain success (resilience), are crucial for high level of team effectiveness. [18] The influence of social capital of university students' research teams on team

effectiveness significantly higher than that of human capital, and it can be explained that research tasks independently undertaken by college students are still in the initial stage and the demand for knowledge and skills is not in a high level, however, the collision of views among team members, as well as seeking help and support from external relationship networks are more important. Therefore, compared with static knowledge, skills and experience, dynamic internal and external interaction among team members has a more significant impact on team effectiveness. Although human capital is an indispensable foundation and support in research process, social capital and psychological capital are keys to achieve outstanding results.

This research has some practical implications as following. For student:(1) Attach importance to team building. The results of questionnaire survey and interviews show that college students generally believe that the human capital of their scientific research team is deficient, especially the professional knowledge and complementarity among members. Therefore, when setting up a scientific research team, college students should pay attention to the complementarity and matching about members' professional knowledge and personality, so as to ensure that the team has a high level of human capital. (2) Strengthen communication with teachers. Research teams of college students are often lack of professional knowledge and research experience. Communicating actively with mentors for guidance is conducive to the improvement of team social capital and to make up for the shortage of team human capital. For universities :(1) Improve the management system. At present, there are still many problems in the management of university students' research teams, such as unclear application process, unclear evaluation standards and irregular reimbursement procedures of scientific research funds. These management problems will have a negative impact on the overall psychological capital of university students' research teams. Therefore, it is suggested that universities further improve the relevant management systems and do well in logistics support to improve the overall quality of scientific research. (2) Provide corresponding support. Since college students are generally lack of scientific research knowledge and experience, universities should actively play a leading role in providing various supports from the perspective of improving three types of capital of university students' research teams. For example, by organizing relevant training and building learning and mutual assistance platforms, universities can provide channels and platforms for university students' research teams to enrich human capital, expand social capital and improve psychological capital.

Acknowledgments

* Financed by National Natural Science Foundation of China, Project Title: A research on the Mechanism of Corporate Philanthropy's Impact on the Employees' Attitudes and Behaviors Based on the Workplace Spirituality (Project No.: 71102020).

References

[1] KE Jiang-lin, SUN Jian-min, SHI Jin-tao, GU Qin-xuan. The Impact of Human, Social, and Psychological Capital on Job Performance: Total Effect, Respective Effect and Moderators [J]. JOURNAL OF INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT. 2010, 24(4):29-35, 47.

[2] Gui C B. Team Human Capital and Worker Mobility [J]. Journal of Labor Economics, 1997, 15(4):567-585.

[3] Seligman M E P. Positive psychology, positive prevention, and positive therapy.[M]// Handbook of positive psychology. 2002.

[4] Goodman P S, Ravlin E, Schminke M. Understanding groups in organizations.[J]. Research in Organizational Behavior, 1987, 9(4):121-173.

[5] Nadler D A, Hackman J R, Lawler E E. III. Managing organizational behavior [M]. New York: Little Brown and Company, 1979, Chapter 3.

[6] Gladstein D L. Groups in Context: A Model of Task Group Effectiveness [J]. Administrative Science Quarterly, 1984, 29(4):499-517.

[7] Hackman J R. The design of work teams. In Lorsh JW, ed. Handbook of organizational behavior [M]. Englewood Cliffs, NJ：PmnticeHall, 1987.

[8] ZHU Yan, ZHNG Meng-chang. Empirical Study on Human Capital, R&D Investment and Enterprise Performance of Enterprise Management Team[J]. Accounting Research, 2013,(11):45-52.

[9] JIANG Xiu-zhen, GU Qin-xuan, Wang Li-hong, , etc.. Learning from mistakes and R&D team innovation: from the perspective of human capital and social capital [J]. Management World, 2011,(12):178-179,181.

[10] Putnam R D. Bowling Alone: America's Declining Social Capital[J]. Journal of Democracy, 1995, 6(1):65-78.

[11] KE Jiang-lin, SHI Jin-tao, SUN Jian-min. Dimensions' developing and structure's testing of team social capital [J]. STUDIES IN SCIENCE OF SCIENCE, 2007, 25(5) :935-940,907.

[12] KE Jiang-lin, SUN Jian-min, SHI Jin-tao, GU Qin-xuan. Empirical study on the relationship between social capital and team effectiveness of enterprise R&D teams——taking knowledge sharing and knowledge integration as mediating variables [J]. Management World, 2007 (3): 89-101.

[13] Luthans F. The Need for and Meaning of Positive Organizational Behavior[J]. Journal of Organizational Behavior, 2002, 23(6):695-706.

[14] Luthans F, Youssef C M. Human, Social and Now Positive Psychological Capital Management: Investing in People for Competitive Advantage [J]. Organizational Dynamics, 2004, 33(2):143-160.

[15]JIANG Jian-wu, ZHAO Shu-ming. Framework for Studying Relationship between Strategic Human Resource Management and Organizational Performance: From a Perspective of Theoretic Integration [J]. CHINESE JOURNAL OF MANAGEMENT, 2007,4(6):779-782,814.

[16] Luthans K W, Jensen S M. The linkage between psychological capital and commitment to organizational mission: a study of nurses.[J]. Journal of Nursing Administration, 2005, 35(6):304.

[17] WANG Zhen-yi. The impact of Shared mental models on team effectiveness——Empirical analysis based on IT R&D team [D]. Southwest University of Finance and Economics,2008.

[18] Qing-Song W U , Shao-Rong C , Yan-Ping Q U . Effect of Knowledge Transfer on Technological Innovation Performance:The Mediating Effect of Psychological Capital[J]. Journal of Business Economics, 2018.