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Top Management Team Heterogeneity Influence on Technological Innovation - The Empirical Analysis on the IT Enterprises from Six Central Provinces

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Abstract: In today's increasingly complex economic environment, the developments of enterprises rely more and more on the strength of senior management team. Especially for the IT companies, who rely on the high-tech development. This article analyzes the influence of the heterogeneity in TMT's education background, age, and working years on technological innovation, depending on the data collected from IT industry from six central provinces. The empirical research shows that the heterogeneity of term and degree will have positive effect on the enterprise technological innovation, while the heterogeneity of age has no significant influence on technological innovation. The IT enterprises from six provinces should absorb the talents who have different education background, accept the new members and make full use of their intelligence to improve the enterprises technological innovation ability and promote competitiveness.

Keywords: top management team; heterogeneity; technological innovation; the six central provinces; IT companies

1. INTRODUCTION

Technological innovation is crucial to the promotion of enterprises' competitiveness, especially in today's increasingly complex economic environment, enterprises not only need to improve the speed of technology upgrading, but also need to apply the outcomes of innovation into practice to get the economic benefits. In terms of distribution of industry, IT industry is brain- intensive industry which needs high investment and has high risks, therefore, the competition among industry reflected more and more on technology patents, research, professional worker and the speed of putting new product into market, etc. Furthermore, technological innovation which stands for companies' core competitiveness has become the key factor that influences companies' development.

During three decades of China's reform and opening, IT industry enterprises have already made considerable improvement, but compared with the large and medium-sized enterprises in developed countries, China is still behind them. In western world, due to developing market economy early, companies have made great achievements in technological innovation. According to relevant data, the proportion of Chinese dependence on foreign technology reached 50%, however, that of developed countries such as United States and Japan was maintained below 5%. According to 2014 EU R&D investment list, which was released by European Commission at the end of 2014,China invested 20.3 billion euros into technological innovation, the proportion was only 3.8%,and there is just only one Chinese company-HuaWei on the top 50 list. We can conclude that China's capability of technological innovation in IT industry is still lagging behind the developed countries. In addition, The regional differences is also a serious problem in technological innovation. The development of six central provinces still rely on resource-intensive and labor-intensive industries, while hi-tech industry development is weak, and in terms of the number of IT companies, the number of IT enterprises in central region significantly less than the number of that in eastern region, and most of them are small-scale. From the point of TMT governance, the members of executive team in enterprises of central region have lower degree than that in eastern region, and talents of IT is lack, so the executive teams cannot effectively lead the enterprises to gain advantages in market competition. As a result, the core leadership in executive teams of six

central provinces is the key to the development of strategic direction. So how to improve their ability and integrate internal factors in order to promote enterprises' technological innovation has become the main task of these IT enterprises.

However, most researches for improving enterprise technological innovation are focused on the market structure, industry characteristics, financial structure, business performance and others. While in the recent years, there are scholars gradually doing some empirical study of TMT, and have proved that executive team and enterprise technological innovation is related, but there is no research combined with technological innovation characteristics in central regions. This paper focused on the effects that technological innovation brings to TMT heterogeneity to do empirical research, and analyzed the relationship between technological innovation and TMT heterogeneity in IT companies. Through the sorted data of IT enterprises in central provinces, we did linear regression analysis, observed whether there are correlation between TMT heterogeneity and technological innovation and how significant it is, then tried to find out the reason why the development of IT companies in central china is weak, at last, based on the central status, trying to give directions for enterprises' further development.

2. FOREIGN AND DOMESTIC LITERATURE REVIEW

2.1 Foreign literature review

Research on TMT has made great achievements, and in Hambrick and Mason's (1984) research framework of upper echelon theory, they thought that as the deciders of company's development strategy, seniors always need to make wised decisions based on their own knowledge and the value they believed to protect company's profits from complicated competition environment[1]. So we can use substitution variables which are closely related with cognitive basis and values，demographic characteristics such as age, Education background, working years to infer the impact of these characteristics on enterprises' strategic choice, including the impact on technological innovation ability. On this basis, Finkelstein and Hambrick, Zenger and Lawrence and other scholars further put forward that the heterogeneity of TMT characteristics will influence enterprises performance[2].On abroad, more and more scholars began to study for TMT heterogeneity and technological innovation. Wiersema and Bantal's findings indicated that age is an important indicator to reveal the experience of TMT members, the greater the age difference is, the easier the innovative view is produced[3], Srivastave and Lee extracted 64 US companies which are from remote communications, PC manufacturing and beer brewing as research samples, and researched on their 245 new product they have introduced in 15 years ,the results showed that the bigger TMT heterogeneity is, the easier they introduce new products before competitors[4].Zahra and Wiklund screened out 109 comprehensive management team, through the study they found that TMT's awareness of market ,product position and functions of heterogeneity were positively correlated with product innovation, but TMT heterogeneity negatively related to R&D investment[5]. Talke selected manufacturing companies as research samples, using the business data from capital market to analyze the problem of TMT heterogeneity, and he found that the diversity of TMT has strongly positive correlation to enterprises innovation, and he also emphasizes TMT heterogeneity is an important prerequisite for enterprises to carry out innovative strategies and adopt innovative results[6].In addition research report from Mooney and Sonnenfeld(2001)and Carpenter(2004)[7]also shows that the higher TMT heterogeneity is, the more obvious companies' innovation will be.

2.2 Domestic literature review

In recent years, in order to meet the needs of economic and social development, Chinese scholars began to focus on the study of TMT heterogeneity, and more and more of them selected Chinese enterprises as research samples to analyze the impacts that TMT heterogeneity had on technological innovations. Ma Fuping and Guo Xiaochuan(2010)researched on 108 resource enterprises, and made empirical analysis by means of questionnaire

survey. It showed that heterogeneity of TMT term, major, background have significant positive influence on technological innovation, and if the executive team used cooperative method to handle conflict, they can reach more outstanding achievement in technological innovation[8]. Xie Fenghua and Yao Xainguo(2007) surveyed eight developed provinces by questionnaire, considering that heterogeneity of TMT age have no significantly influence on technological innovation, while heterogeneity of term has significantly positive influence on innovation. Lei Hui and Liu Peng(2013)used the data from SME board of Chinese listed companies, the research showed that heterogeneity of TMT age, gender had significant negative correlation with technological innovation, and degree, major, background are positively related to technological innovation[9]. Meanwhile, there are some scholars got opposite conclusion through empirical research, for example, Wang Deying and Liu Jianhe(2011) selected 350 listed companies of SME board, collecting the data of their technological investment to do empirical research, they thought the relationship between technological innovation and TMT heterogeneity is not significant[10]. Zhu Jinwei and Peng Jinjin(2014)collected 210 enterprises in IT industry and bio-pharmaceutical industry as sample, they considered that the heterogeneity of term is not conducive to information sharing and strategic unity and have negative effects on enterprises' innovative investment[11].

2.3 Literature review

Combing the domestic and foreign literature, we found that the researches on TMT heterogeneity and technological innovation have reached great achievement, but most of articles are to explore IT industry all over the country. There are few articles focused on the status of technological innovation in central region's IT companies. Therefore, these papers argue that only do empirical studies from the view of the regional characteristics of IT companies in six central provinces can we put forward more realistic developing strategies. Due to the relying on traditional industries, lacking in regional advantages and talents, slowly information receiving, lagging in digesting and applying latest theory and technology and national policy influences, development of the central region has lagged behind eastern region a lot, especially the development of IT industry which is lower than the national average. So, we cannot apply the research conclusion about entire country's IT industry to the development of central region, but must use empirical conclusion related to the characteristics of central region.

In this paper, on the basis of other researches achievements, we selected main board's listed IT companies in six central provinces as samples, using the method that combines theoretical deduction and empirical analysis to study the relationship between TMT heterogeneity and technological innovation.

3. THEORETICAL ANALYSIS AND THE RESEARCH HYPOTHESIS

3.1 Degree heterogeneity and technological innovation

According to social classification theory and social identity theory, individuals classified themselves by social classification, and are defined with their own group, and by achieving or maintaining a positive social identity to improve their self-esteem, while degree may considered as an important criterion for self-classification. The group which have same degree will produce similar opinion easier. On the contrary, individuals with different degree are easily generated varies views. The greater the degree difference between TMT members is, the more conducive to promote enterprises' technological innovation. When it comes innovate opportunities, discussion between TMT will enhance executives' identification of opportunities and cognitive abilities, so that they can deal with previous information, seize innovative opportunities and improve enterprises' innovative ability. When making innovative decision, executives' different experiences on education determine their different cognitive and psychological on strategic decision, so the diversity of members' degree will help them analyze the complex problem from different aspects, which is beneficial to improve the quality of decisions[12].While harmony discussion among executives could significantly strengthen positive impact that heterogeneity of degree has on decision, without proper communication, heterogeneity of degree will lead to

cognitive differences which will make conflicts in team discussion staying in the initial stage, and will not be able to achieve communication and integration of their views. However, with discussion, they will re-examine their own views whether it is complete and whether having considered the key factors when they meet new information and circumstances. The survey of Bantel and Jackson found that in most of banks samples, TMT heterogeneity of degree and work background are positively correlated with innovation[13]. Amason and Sapienza believed that, different degree in TMT will promote the optimization of decisions, because they analyze the current problem from different aspects[18]. So it is obvious to see that enterprises technological innovation is closely related with heterogeneity of executives education and training they have accepted. According to the analysis above, this paper puts forward the following hypothesis:

H1: Heterogeneity of TMT degree and enterprises' technological innovation are significantly positive correlated.

3.2 Age heterogeneity and technological innovation

According to the age stratification theory, age may constraint individuals' ability to play a certain role, and social responsibility of different ages is not same, which becomes an important factor to influence individuals to make decisions. Accordingly, it can represent executives experience, the willing of risk bearing and the support degree of change and innovation, and it also can affect an enterprises' output. The study of Wiersema and Bantal showed that, if there is big difference in managers' ages, it can produce diverse views on strategic issues to stimulate companies consider changing strategy[6]. For young executives, although they lack management experience, they may be more willing to innovate and changes; while the seiner members have the advantage of management experience and social relationships, they will tend to make conservative strategy. So, if executives are in different ages they could communicate actively and develop their own advantages so that decisions that companies made would not be too aggressive or too conservative, but helpful to promote sustainable development of enterprises. According to the analysis above, this paper puts forward the following hypothesis:

H2: Heterogeneity of TMT age and enterprises' technological innovation are significantly positive correlated.

3.3 Term heterogeneity and technological innovation

According to principal-agent theory, shareholders are seeking the maximum profit, and the agents are pursuing the maximum of their own income, luxury consumption and leisure time, therefore, executives of different terms have their respective advantages and disadvantages: executives who have longer term have experienced every development stages of enterprises, and understand the enterprises' situation better than freshmen and have done quite contributions to companies' development, but in the case of asymmetric information, moral hazard would be easily generated, executives became conformism and tired of innovation, finally, it would restrict the development of companies ;although executives who have shorter term lacked the understanding of companies, companies equity incentives are often be able to bring them huge profits when executives pursuit the maximum interests, it will also encourage executives present new ideas and views which are according to current situation, so that companies' innovation could be driven. Srivastava and Lee (2005) found that if term difference between TMT is great, companies would actively introduce new products, rather than imitate other companies[7]. Li Zhengwei, Zhang Pingping also confirmed that the higher term heterogeneity between TMT is , the more sensitive companies will be to the external environment. As a result, appropriate adjustment for strategy can be easily made, which is helpful to the improvement of enterprises performance[14]. Therefore, if TMT members had different terms, it would easily generate complementary advantages, inspire diverse views, form creative thinking, produce a variety of strategic plan and then carry on comprehensive evaluation so that it could ensure the quality of decision and promote technological innovation. Term heterogeneity is helpful to break the original management mode, reshape the strategic opportunity, meanwhile, the bigger term heterogeneity is ,the greater changes enterprises' strategy have, which is helpful for technological innovation. Therefore, according to the analysis above, this paper puts forward the following hypothesis:

H3: Heterogeneity of TMT term and enterprises' technological innovation are significantly positive correlated.

4. RESEARCH DESIGN

4.1 Sample selection and data sources

In this paper, we use the data of IT industry from six central provinces (Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan), because the competition in IT industry is intense, it requires executives to have sufficient ability to control the internal and external environment as well as resources, so we selected main board listed IT companies in six central provinces as research samples, with 2011-2013 as inspection interval, and perform the following screening process: (1) excluding the company containing abnormal values in test interval; (2) considering the ST company's financial condition or other circumstances which may appear abnormal. In order to avoid the influence of extreme values, exclude ST samples. Finally, we collected 53 samples from 18 companies including Chang river Information, and the data of samples observation are obtained from listed companies' annual report, then we checked them one by one to get final data. All data in this paper are collected from Juchao Website, CNKI Patent Database, China intellectual property office patent search and service systems and other related website. Through the empirical analysis, we studied on the relationship between TMT heterogeneity and technological innovation.

4.2 The selection and measurement of variables

4.2.1 TMT heterogeneity

This paper selects the TMT defined as the top executives having the title of president, CEO and manager, including the president, vice president, CEO, manager, vice manager, secretary of the Board and other key management executives. In this article, independent variables are segment particularly: degree(HEL) was divided into the following, college and under-college, bachelor, master and double degree, PHD, postdoctoral; Age(HA) was divided into under 30 years-old,31 to 40 years-old,41 to 50 years-old,51 to 60 years-old and more than 61 years-old; Term(HT) was divided into 1 years,1-2 years,2-3 years,3-5 years and more than 5 years. As for the description of each independent variables' heterogeneity, this article used Herfindah Index to measure, and its formula is below:

$$H=1-\sum_{i=1}^{n} Pi^2$$

Pi represent the percentage of team members in each classes, N represent the number of species; H indicates the degree of heterogeneity, and it is a number between 0-1,if the value of H were big, it means the degree of TMT heterogeneity is high, whereas is low.

4.2.2 Technological innovation

Technological innovation(TIP), including the new technology developed by the enterprises and the recreating to original tech. Most of researches will use average R&D, R&D, the radio of R&D and sell, patent number or new product number to determine the index of technological innovation, while this article use the number of patents to measure enterprises' technological innovation. In addition, the number of patents can be selected from applied quantity, examined quantity and awarded quantity, in order to depict enterprise' technological innovation accurately and reflect the achievement of technological innovation, we finally choose the number of awarded patents. The reasons are following: first of all, patents embody the unique achievement of enterprises, they are original and exclusive; secondly, patents must pass through the related department strictly, only the products or method with innovation can be patented. Therefore, patent can measure the level of technological in an enterprise better.

4.2.3 Control variables

Joining the control variable can evaluate the correctness of the regression model and refuse other

explanation of the empirical results[14]. Some factors may influence explanatory variables and explained variable, and this article used enterprise size, team size and companies performance as control variables: first is enterprise size(Size). Miller thought the scale of enterprises is the main factor which would influence TMT characteristic and organizational outcomes. Enterprises in different scales have their own advantages to innovate, for big companies, they have the ability and motivation to innovate, while for small companies, they are more flexible in innovation. We use the total number of employee to describe the size of companies. Considering that using the original data will exaggerate the number of staff, and adversely affect the result of regression analysis, for that, we use the natural logarithm of employees number to measure the firm size. Secondly, team size (Tsize). According to heterogeneity index, team size may have influences on the level of heterogeneity, so this article selected the team size as control variable. Thirdly, enterprises performance (ROA). Only the companies in good performance could they have plenty of money to invest innovation, this paper used return on assets to measure performance.

4.3 Research design

To examine the relationship between TMT heterogeneity and technological innovation, this paper built the following four basic models to test the relations:

$$TIP=\alpha+\beta_1\sum Control+\varepsilon \quad (1)$$

$$TIP=\alpha+\beta_1\sum Control+\beta_2 HEL+\varepsilon \quad (2)$$

$$TIP=\alpha+\beta_1\sum Control+\beta_3 HA+\varepsilon \quad (3)$$

$$TIP=\alpha+\beta_1\sum Control+\beta_4 HT+\varepsilon \quad (4)$$

Model 1 considered the relation between technological innovation and control variable. Model 2considered the relation between degree heterogeneity and technological innovation after added the control variables, to examine whether there is a positive relation between them,and to test hypotheses 1. β_2 in model 2 established a basic premise for the conductive effect.Similarly, model 3 and model 4 respectively were used to test hypothesis 2 and hypothesis 3.

5. EMPIRICAL ANALYSIS

5.1 Descriptive analysis

Table 1. Descriptive analysis

	N	Minimum	Maximum	Sum	Mean
TIP	53	0	328	2188	41.283
HEL	53	0.21	0.69	27.01	0.5096
HA	53	0	0.72	20.86	0.3936
HT	53	0	0.78	28.06	0.5294
SIZE	53	6.32	9.09	411.34	7.7611
TSIZE	53	4	12	350	6.6038
ROA	53	-9.91	9.95	214.83	4.0534
Valid N	53				

Table 1 reports the descriptive statistics of the main variables.The average of TIP is 41.2830, its minimum is 0, maximum is 328,shows that the difference in the level of enterprises technological innovation is apparent, and the level as a whole is low. HEL's minimum is 0.21, maximum is 0.69 and the average is 0.5067, it shows that there is little difference between sample companies, the degree in TMT members has bigger heteroheneity. HA's minimum is 0,the maximum is 0, 71, shows that the difference in TMT ages is apparent, the average is 0.3936 lower than other index,it means most of enterprises have lower age heterogeneity. HT's minimum is 0, the maximum is 0.78, shows that the difference in sample companies' term heterogeneity is apparent, and the average is 0.5294 higher than other indexes, it means most companies TMT have big difference in term. The average of ROA is 4.0534, the minimum and maximum presents obvious difference, it means in different sample companies the profitability is of apparent differences, the developing situation of every enterprises is different.

5.2 Correlation analysis

Table 2. Pearson Correlation analysis

	TIP	HEL	HA	HT	SIZE	TSIZE	ROA
TIP	1						
HEL	0.373(**)	1					
HA	0.194	0.549(**)	1				
HT	0.522(**)	0.166	0.086	1			
SIZE	0.501(**)	-0.017	0.078	0.117	1		
TSIZE	0.245	0.293(*)	0.193	-0.069	0.485(**)	1	
ROA	0.22	0.324(*)	-0.002	0.005	0.294(*)	0.041	1

Table 2 report the Pearson correlation analysis between the variables. The result shows that: TIP and HEL's simple correlation coefficient is 0.373, concomitant probability p-value is 0.006, if significant levels of α were 0.01, due to the concomitant probability p less than the significant level, so it can be considered that there is a significant correlation between this two variables, hypothesis 1 has been verified; TIP and HA's simple correlation coefficient is 0.194, concomitant probability p-value is 0.163, if significant levels of α were 0.01, due to the concomitant probability p more than the significant level, so it can be considered that there is no significant correlation between this two variables,hypothesis 2 has not been verified; TIP and HT's simple correlation coefficient is 0.552, concomitant probability p-value is 0, if significant levels of α were 0.01, due to the concomitant probability p less than the significant level, so it can be considered that there is a significant correlation between this two variables, hypothesis 3 has been verified.SIZE and TIP's simple correlation coefficient is 0.501, concomitant probability p-value is 0, if significant levels of α were 0.01, due to the concomitant probability p less than the significant level, so it can be considered that there is a significant correlation between this two variables,while TSIZE and TIP's simple correlation coefficient is 0.245, concomitant probability p-value is 0.077, ROA and TIP's simple correlation coefficient is 0.22, concomitant probability p-value is 0.114, so it can be considered that there is no significant correlation between this two variables.

5.3 Regression analysis

In multivariate linear regression equation,the explained variable will be affected by other factors at same time, so they need more than one variable to explain. If some explanatory variables had auto-correlation, namely collinearity problem, it will bring difficulties to evaluate the contribution of explain variables, making parameter estimation unstable.In addition, no matter how explain variables are,the value of corresponding residual variance should be equal, or it could be considered as heteroscedasticity phenomena, which will affect the validity of estimation. Therefore, in order to illustrate the rationality of regression, this paper did co-variable linear and heterosedasticity test to variables.

Table 3. Collinearity diagnosis

Model		Collonearity Statistics	
		Tolerance	VIF
1	(Constant)		
	HT	1	1
2	(Constant)		
	HT	0.986	1.014
	SIZE	0.986	1.014
3	(Constant)		
	HT	0.958	1.044
	SIZE	0.985	1.015
	HEL	0.971	1.03

5.3.1 Collinearity test

To determine whether there is a linear relationship between variables, we can use tolerance and variance inflation factor of explanatory variables to explain, that is to say:tolerance is the value between 0 to 1, the bigger the value of tolerance is, the weaker the

explanatory variables' ability to explain the relationship between explained variables, and the relevance with other explanatory variables is stronger, namely the multicollinearity level is high; the bigger the value of VIF is , the more likely to have linear, when the value of VIF more then 10, it means there is a serious collinearity between explanatory variables. According to table 3, the collinearity diagnosis as follows: tolerance are 0.958,0.985,0.971, and there is no very small values; the value of variance inflation factor are 1.044, 1.015, 1.030, and there is no very big value, they all less than 10, that means there is no collinearity problem between the explanatory variables in the equation.

5.3.2 Heteroscedasticity test

In this paper, we test variables heteroscedasticity by drawing residual plot between the predicted explanatory variables and student's residual, residual should be randomly distributed on the both sides of a horizontal line which through the zero point. If the residual variance showed a significant increase or decrease trend with explanatory variables' increase, it appeared heterosced asticity phenomenon. According to the residual scatter-plot, the result of heteroscedasticity test showed that:through the observation of residual distribution, we respectively regard the degree, age and term heterogeneity as X-axis, and technological innovation as Y-axis, drawn three residuals scatter-plot, most of observations parallel distributed evenly around ±100, the points' distribution is random, predicted values and the students residual have no obvious relationship, that is to say, there id no heteroscedasticity between variables.

Table 4. Regression analysis

	TIP			
	Model1	Model2	Model3	Model4
SIZE	39.753***	54.168***	40.004***	30.923***
	-3.171	-4.6	-3.213	-2.881
TSIZE	0.446	6.725	0.636	3.21
	-0.094	-1.46	-0.134	-0.798
ROA	1.617	2.318	1.624	2.111
	-0.623	-0.916	-0.634	-0.965
HEL		236.915***		
		-3.756		
HA			42.501	
			-1.294	
HT				239.213***
				-4.589

5.3.3 Regression analysis

Table 4 report the result of regression analysis between the variables. The result shows that: Model 1 indicates that the Size has a significant positive correlation with the TIP ($\beta = 39.753$, $p < 0.01$), suggesting that the scale of the enterprises will have obvious positive effects on technological innovation, the greater the scale of enterprises is, the more conducive to enterprises' technological innovation; while Tsize has no correlation with TIP($\beta=0.446$，$p>0.01$), shows that the size of the senior management team would not affect the technological innovation of the enterprise. Model 2 indicates that HEL has a significant positive correlation with the TIP ($\beta= 236.915$, $p < 0.01$), suggesting that the degree heterogeneity of TMT will have obvious positive effect on technological innovation, hypothesis 1 has been verified.Model 3 indicates that there is no relationship between HA and TIP($\beta=42.501$，$p>0.01$), suggesting that the age heterogeneity of TMT would not affect companies' technological innovation. Model 3 indicates that HT has a significant positive correlation with the TIP ($\beta= 239.213$, $p < 0.01$), suggesting that the term heterogeneity of TMT will have obvious positive effect on technological innovation, hypothesis 3 has been verified.

5.4 Robustness test

According to the patent law's regulation, the patent application is divided into three different legal procedures, including patent application, acceptance and awarded, and there are large time span between the three part. And even if the patent application were accepted, it may not be granted because they does not meet the law condition. While this article selected the number of patents granted after being scrutinized by relevant government as technological innovation's substitute variable, there is a certain time lag with the actual

Table 5. Robustness test

	TIP			
	Model1	Model2	Model3	Model4
SIZE	38.854***	55.539***	39.112***	30.313**
	-2.914	-4.558	-2.95	-2.56
TSIZE	2.073	10.373	3.186	0.6
	-0.413	-2.176	-0.628	-0.135
ROA	2.376	2.178	2.394	2.855
	-0.861	-0.832	-0.873	-1.183
HEL		274.225***		
		-4.202		
HA			43.718	
			-1.25	
HT				231.387***
				-4.023

completion of technological innovation, it may not represent all the innovation of the business and can not accurately measure the enterprise innovation performance. Therefore, in order to accurately calculate and characterize the enterprises' technological innovation, it is necessary to appropriately consider the actual time of technological innovation's complete, we use "applied patent *0.5+accepted patent*0.5" to measure technological innovation, in order to check the robustness of empirical analysis. Table 5 report the result of regression analysis after technological innovation being substituted by "applied patent *0.5+accepted patent*0.5".

The result of table 5 shows: TIP and HEL's concomitant probability p value is less than the significant level(p=0), suggesting that the degree heterogeneity of TMT will have obvious positive effect on technological innovation, hypothesis 1 has been verified; TIP and HA's concomitant probability p value is more than the significant level(p=0.217), suggesting that the age heterogeneity has no relationship with technological innovation, hypothesis 2 has been refused; TIP and HT's concomitant probability p value is less than the significant level(p=0), suggesting that the term heterogeneity of TMT will have obvious positive effect on technological innovation, hypothesis 3 has been verified.

According to the analysis, using "applied patent *0.5+accepted patent*0.5"instead of "awarded patent"to re-measure the technological innovation and eliminate extreme value, it has been verified again that the degree and term heterogeneity of TMT have positive effect on technological innovation, and age heterogeneity of TMT does not correlated with technological innovation, the empirical results remain the same, that means this article's conclusion is reliable.

6. RESEARCH CONCLUSION AND REVELATION

6.1 Research conclusion

By analyzing the detailed situation during 2011-2013 of these listed IT companies which are located in six provinces of central China, and investigating relationship between the innovation ability of a company and the heterogeneity in education background , age, working years of their TMT , we could come to several points: (1) the bigger differences in TMT's education background, the better innovation ability the company will have, executive team heterogeneity degree for every increase unit, enterprise technological innovation will be increased 236.915 units;(2)The difference between senior managers' ages won't affect the company's innovation ability will not impact on enterprise's technological innovation;(3)Different working years between top managers has huge positive influence on innovation ability,the executive team term heterogeneity for every increase unit, enterprise technological innovation will be increased 239.213 units.

6.2 Research enlightenment

As long as the quick development of economic globalization, enterprises face more challenges in today's society.Due to the particular nature character of IT industry, they are the leaders of high and new technology.Therefore, if they want to stand out in the increasingly fierce competition, they will need to speed up the change, promote independent innovation ability.IT companies, therefore, the leadership of the senior management team is the key for an enterprise to survive and develop. The six provinces in central are still in

developing stage. Their main income still heavily depend on resources and heavy industry, and if the situation can't be change, IT industry will be hard to get the economic sustainable development, and the economic gap with the eastern region will become bigger. Therefore, according to the empirical research, this report would give these suggestions :

First, recruiting diverse talents, and attaching great importance to learning ability of senior managers. The heterogeneity in education background can effectively promote enterprise technology innovation ability. Therefore, IT enterprises should pay more attention to their managers' skill developing and offer regular training courses. It can help managers to accept the latest knowledge and information, and develop proper business strategy for company in return to prevent being sifted out from competition.

Second, paying attention to the echelon construction, and strengthening the talent reserves. For a long term employees, the enterprise may take appropriate encouragement to keep they staying in company continue to create benefits. At the same time, it's also important to train short term members and offer them a developing platform. Companies should learn to align exploring internal talents with recruiting talents and make full use of their respective advantages.

Third, the compensation distribution should reflect differences, proper leaning to older workers. On the one hand, it may stimulate the long term employees' enthusiasm which could bring more profits ; On the other hand, it can also promote the new employees to determine the long-term working goals, in order to obtain the maximize benefits to work actively, and drive the enterprise technology innovation.

Fourth, to absorb new employees termly. Through the empirical analysis, we could find out that the working years of the senior management team has a huge affective to technological innovation. So, the enterprise can joint executive search firm to mine external talents, and look for experienced manager to enrich the enterprise team. Short term employees can bring new ideas for enterprise development which meets the demand of the development of IT enterprises and brings more performance for the enterprise.

Fifth, insisting on technological innovation. In this paper, the empirical results show that the enterprise technology innovation has no significant correlation with their KPI. So companies should not ignore their technological innovation development just because of short-term low profits. On the contrary, they should support technological innovation development to achieve new technology upgrading, then enterprises will get better development.

6.3 Research limitation

This article selects only limited samples which focus on large a-share listed companies. In the current development environment of China, IT companies generally are small enterprises, this report does not cover the whole different size of companies in this industry. And, as a result of state-owned enterprises, foreign enterprises and private enterprises have different characteristics and operating mode, it is necessary to go to deep study of theses senior management teams who have different culture background and different ownership.

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