

Research Article

Does technical manager affect performance?--Evidence of Shaanxi private tech enterprise of China

Zunhuan Shen¹, Fan Wang², Ziyu Guo³

School of Economics and Management, XiDianan University, China,710071

ABSTRACT: Technical manager is the key to improve performance with innovation, but literature lacks of research about the influence of the characteristics of technical manager on performance. Based on the sample coming from Shaanxi private tech enterprise of China, it shows that the length of work of technical manager has positive impacts on both the innovative performance and financial performance. Taking the industry into account, the education level of technical manager would improve the innovative performance of company in manufacturing and information industry. Therefore, paying attention to the length of work and education level of technical manager is important to improve the innovative and financial performance of private technical enterprise.

Keywords: human capital capital; technical manager; innovative performance; financial performance

I . Introduction

In the times of innovation, intangible capital such as knowledge replaces the traditional productive factors and become the key factors for innovation and development. Literature shows that high quality human capital would create value, and setting up the capacity of human capital and knowledge management is the important factors of success (Barney, 1991), and lots of literature focus on the topic of human capital. As the impacts of it, most scholars supply evidence to support the conclusion that human capital could improve the performance of company (Weisberg, Jacob, 1996; Abraham et al., 2005; Xingzhen, Zhu, 2003; Jiaming Li, Fubing Li, 2005; Xin Xu, 2009; Suying Gao et al., 2011). However, there are few works to study the impacts of technical manager on performance, and the limited papers have not a certain conclusion. For example, while Loulou Jiang and Penjun Dai (2009), Qinghong Dong and Yuebing Li (2010) regard that the age of technical manager has positive impacts on financial performance, but Yefan Zhang (2014) and Yuchun Liu (2016) have the opposite results.

In order to make sure the impacts of technical manager on performance (including innovative and financial performance), based on the data of Shaanxi private technical company in 2016, the paper make an empirical study on the influence of the age, education level and length of work of technical manager on both the innovative and financial performance. There are two contributions of the paper. First, the paper study the influence of technical manager from the age, education level and length of work on performance, which would help us to understand the traits of technical manager. Second, different from literature, the paper not only study the impacts of technical manager on innovation performance, but also on financial performance. Owing to the financial performance is the final goal of innovation, the paper would benefit us to

study the role of technical manager in enterprise. The rest of the paper is organized as follow. Section I is the literature review and hypothesis, Section II is the research design, Section III is the results and the conclusion in the section IV.

II . Literature review and hypothesis

Technical managers are the key factors in the process of innovation, therefore they not only influence the innovative performance, but also the financial performance. Shanping Yan (2007) regards that the human capital is a comprehensive abilities of a person of knowledge, technique and education to improve the productive efficiency, and the human capital could be measured with age, education level and length of work. Based on this point, the paper analysis the characteristics of technical manager from these three perspectives.

A. The relationship between the age of technical manager and performance of enterprise

The age of technical manager represent the accumulate knowledge and Experience of human capital, which is likely to influence the way and consequence of decision making, and therefore determine the performance of company. In different age, person has various capacity and advantage. In literature, Wiersema and Bantel (1992), Child and Mellons (1992), Yefan Change (2014), and Yuchun Liu (2016) regard that young technical manager is initiative, easy to make comparative flexible strategic, has spirit of innovation and adventure, and tend to accept challenge to suit the changes of environment. On the contrary, with the age increased, technical manager becomes conservative, lacks of incentive to innovate, and has more wills to be evade risks. As a results, the aged technical manager is likely to bring worse innovation performance. On this view, we have the assumption as below:

Hypothesis H1: The age of technical manager is negative

related with innovation performance.

In essence, the innovation performance are contact with financial performance tightly. With the high level of innovation, companies are likely to have high technology, which would reduce the cost of produce, improve the quality of products and make more profit. However, literature has not clear results about the relationship of the age of manager and financial performance. In general, there three different views about the relationship. First, some scholars regard that they are negative related. Tihanvi(2008), Jinlong Wang (2014), Yefan Chang (2014) and Yuchen Liu (2016) suggest that the bigger the age of technical manager, the more conservative and more opportunities lose, and the less financial performance is. Second, some scholars argue that they are positive related with each other. For example, Liqun Wei and Zhihui Wang(2012) conclude that the age of manager has positive impacts on financial performance. And the last but not least, there is evidence to support the third view. For instance, the studies of Ying Wang(2014), Weimin Cheng(2017) show that there is no relationship between the age of manager and financial performance. Therefore, it is necessary to test the relationship between the age of technical manager and financial performance with different industry such as private technical enterprise.

Comparing with the national company, private enterprise, especially private tech company faces more policy risk and market risk. On this point, aged manager tend to maintain the status quo to avoid risk, but young manager have strong incentive to make adventure. Bantel and Jackson (1989) suggest the age is one factors to influence the risk preference of manager, and Wiersema and Bantel (1992) support the opinion with new evidence. In the process of carrying out the strategic, aged manager tend to make decisions based on their experience with the mind of avoid risks, which is likely to lose opportunities to make profit. Different from the aged manager, with the changes of market, young manager has strong learning power and incentive to accept new ideas and techniques, and is more likely to grasp the market chance to make profit. Therefore, we have the hypothesis below:

Hypothesis H2: The age of technique manager is negative related with financial performance.

B. The relationship between the education level of technical manager and performance

Education level is an important measurement of the knowledge of human capital and the evaluate variable of innovation. The education level of technical manager reflect the the capacity of learning and management, and as a result, both of the innovative and financial performance is likely to be impacted. From the point of innovation performance, literature support the view that education level would improve the innovative performance. The research of Wiersema and Bantel (1992), Flood et al. (2000) and Xin Huang (2010) regard that technical managers with high education level have strong cognitive competence to social and power to collect information in the market. Furthermore, the higher the education level of the technical manager has, the faster the

new product researched, which is likely to improve innovative performance. So, we have the hypothesis as below:

Hypothesis H3 : The education level of technical manager is positive related with innovation performance. Education is the wealth of a person and company. High education level indicates wide insight and strong capacity to deal with problems. However, literature has opposite views about the influence of education on performance. On one hand, Hambrick and Chen (1996) using the sample of 32 American air company in 8 years, finds that the education level of managers has positive impacts on the growth ratio of market share and profit. The perhaps reasons are the education level is higher, the capacity of collecting and dealing with information is better. The researches of Tihanyi(2008) and Nana Jing (2012) find that the education level higher, the effective information acquired more, which is likely to benefit the development. Different from the view above, scholars supply other various opinions. For example, the study of Daily and Johnson (1997) show that the background of education of CFO is negative with one performance at least, but in China, research regard that the education level is not significant related with performance (Ying Wang, 2010; Weimin Cheng, 2012). In fact, private tech companies have the characteristics such as high tech, high investment, high return and high risk, which need the help of high education level manager. In this point, we have the hypothesis,

Hypothesis H4: The education level of technical manager is positive related with financial performance.

C. The relationship between the length of work of technical manager and performance

Innovative human capital is the source of innovation. High tech companies need the help of high capacity of manager, especially the technical manager. Barney (1991) regard that high quality of manpower is the source of innovation, and the length of work and experience of them represent their capacity to work and organize the inputs factors. Weisberg and Jacob(1996), Liqun Wei and Zhihui Wang (2002), Jin Zhang and Guanzhu Lu(2010) suggest that technical manager with long work have professional capacity, experience and manage power, and strong power of taking on stress. This point maybe imply that it is better to hire technical manager with long work experience. So, we have the hypothesis:

Hypothesis H5 : The length of technical manager is positive related with innovative performance.

The experience of technical manager also play an important role to improve the financial performance. The longer the work of technical manager, the more familiar with the rules of the company. Therefore, companies have better financial performance. And there are evidence around the world. Eisenhardt and Schoonhoven (1990), Hambrick and Chen (1996) regard that the length of work of technical manager is positive with financial performance. In China, Xiaoming Liao and Sen Li, Jinlong Wang and Chuangfei Li(2007) also regard that the length of manager is positive related with financial performance. With the sample of middle-small

enterprise of Shandong of China, Jin Zhang and Guanzhu Lu(2010) point out that the experience of manager would improve the development of enterprises. Upon this view, we (2006) have the hypothesis below:

Hypothesis H6: The length (experience) of technical manager is positive related with financial performance of company. In order to test the hypothesis above, we will make an empirical study in net section.

III. Research Design

A. Samples and variables

In order to test the hypothesis, we make an investigation and collect the data of 189 Shaanxi private technology enterprise in 2016. The software to deal with the data is SPSS24.0.

In the paper, there are three kinds of variables, explained variable, explaining variable and controlling variable.

(1) explained variable. For technical enterprise, the most important issue is to make innovation and improve the performance. In literature, most papers pay more attention on the financial performance. But in fact, the innovative performance is also important for technical company. Different from literature, in the paper, we focus on both the innovative performance and financial performance, named performance, as the explained variable. As for the innovative performance, the number of patent usually taken as the measurement in literature. For example, Xiaofei Xu(2017) regard that the aim of applying for patent is to transfer the it into knowledge, in the form of outputs of innovation, the innovative activities and technical knowledge. In the paper, we use the number of patent as the measurement of innovative performance. We collect the data of 2014, 2015 and 2016, and taking the average of innovative performance as the var

(2) explaining variable. American scholar Schultz suggest that the valuable human capital includes capacities such as learning, finishing work tasks, creating new product and dealing with disequilibrium. Weisberg and Jacob(1996) regard that the human capital include general human capital and special human capital, the general human capital is measured with the length of work, and the special human capital is measured with the education level of worker. On this point, in the paper, there are three explaining variables, including the background of human, measured with the age of worker, the general human capital, measured with the education level, and the special human capital, measured with the length of work. Based on the work of Xiaocui Han (2013), the education level is defined as 1 if worker has acquired the middle education, 2 if worker has high middle education, 3 if worker has bachelor degree, 4 for master degree, 5 for doctor degree, and others 0.

(3) controlling variable. There are lots of variables influence the process and outputs of research and performance. Bhagat et al.(2000) regard that the scale of enterprise has impacts on innovative performance. Claessens (2002) suggest that the share ration of the biggest shareholder would influence the decision making and development of enterprise, and the ratio of researchers in the total workers and the innovative investment are also related with the performance since the innovation is an periodicity and combined activities. To sum up, we take the share ratio of the largest shareholder, the ratio of researchers taking account of the total number of workers and the research and development (R&D) investment as the controlling variables.

All the variables are listed in Table 1.

Table 1 Variables

Types of variable	Name of variable	Symbol of variable	Definition of variable
Explained variable	Innovative performance	Patent	Total quantity of patents
	Financial performance	Y	The average earning of three years
Explaining variable	Background of human capital	Age	Age of technical manager
	General human capital	Degree	Education level of technical manager
	Special human capital	Year	Length of technical manager
Controlling variable	Share ratio of the largest shareholder	Share	Share ratio of the largest shareholder
	Proportion of researcher	People	Proportion of researcher
	Total asset	Cap	Total asset
	R&D investment	RD	R&D investment

B. Descriptive statistics of the sample

With the data above, we have the results of descriptive statistics in Table 2.

Table 2 The results of descriptive statistics of the sample

	N	Minimum	Maximum	Average	Standard deviation
Patent	189	1	145.00	9.666	16.848
Y	189	4.70	216056.31	9568.692	30085.298
Age	189	28	80	45.76	11.124
Degree	189	0	5.0	3.466	0.992

Year	189	0	45.00	14.377	8.139
Share	189	1	100	61.69	25.645
People	189	0	1.0000	0.575184	0.285
Cap	189	9.38	306589.0	12218.873	37320.285
RD	189	0.00	15383.00	495.508	1372.445

The data in Table2 shows that the average number of patent of Shaanxi private tech company is 10, and the average earning per year is 9568.692 ten thousand yuan RMB, but the standard deviation is large, implying they are various in the term of financial performance. It also shows that the average age of technical manager is 45, the score of education level of technical manager is 3.4, equivalent to be master degree, and the length of work is 14, implying they are full of experience. According to the data in Table 1, the researchers take account of 57.5% in the total human capital, indicating the private technical enterprise have high level of innovation.

C.Models

Based on literature above, we have two models as below:

Model一:

$$patent = \alpha + \beta_1 age + \beta_2 degree + \beta_3 year + \beta_4 share + \beta_5 people + \beta_6 \ln cap + \beta_7 \ln RD + \mu$$

Model二:

$$Y = b_0 + b_1 Age + b_2 Term + b_3 Edu + b_4 Size + \varepsilon$$

In the models, patent is the innovative performance, Y is the financial performance, α is the constant, μ is random error, and Age、Degree and Year represent the age, education level and length of work of technical manager, respectively. Other variables in the model showed in Table1.

IV. Results and explanation

Upon the research design above, we make empirical study on the impacts of the characteristics of technical manager on both innovative performance and financial performance.

A.The characteristics of technical manager on innovative performance

With the data, variables and models above, we have the result in Table3.

Table 3 The influence of characteristic of technical manager on innovative performance

Model	Nonstandardized coefficient		standardized coefficient	t	Sig.	Total linear statistics	
	B	Standard error				tolerance	VIF
(constant)	-11.039	9.756		-1.132	0.259		
Age	-0.073	0.117	-0.048	-0.626	0.132	0.802	1.246
Degree	0.636	1.276	0.036	0.498	0.159	0.906	1.104
Year	0.245	0.167	0.116	1.471	0.093	0.748	1.337
Share	-0.024	0.046	-0.036	-0.520	0.204	0.966	1.035
People	4.309	5.072	0.071	0.850	0.197	0.662	1.510
lnCapital	0.653	1.200	0.079	0.544	0.387	0.223	4.494
lnR&D	3.066	1.571	0.271	1.952	0.053	0.241	4.153
Model test	Durbin-Watson=1.987			R=0.436		Adj R square=0.190	

From the data in Table3, the explain ratio of the model is 15.8%, and there is no total linear problem, implying the regression coefficient estimation is unbiased and reliable. In the model, the DW is close to 2, suggesting there is no self-correlation problem. Therefore, the model has passed the test.

Upon the data in Table3, it shows the age of technical manager has negative impacts on innovation performance, but has not passed the T-test, which does not support the hypothesis H1. The education level of technical manager has positive impacts on innovative performance, but is not significant, and the

hypothesis 3 is not supported. At the same time, the length of technical manager has positive impacts on innovative performance, which is significant on the level of 10%, indicating the hypothesis 5 is supported in a certain extent. In order to analyze whether the industry influences the relationship between the characteristics of technical manager and innovative performance, we select the manufacturing industry (99 company) and information industry (44 company) as the sub-sample to make correlation analysis. Table 4 and Table 5 are the results.

Table 4 The correlation analysis about the manufacturing industry

Variable	Patent	Age	Degree	Year	Share	People	Cap	RD
Patent	1							
Age	0.058	1						
Degree	0.122**	-0.001	1					
Year	0.269**	0.327**	0.082	1				
Share	-0.093	0.049	-0.147	0.025	1			
People	-0.123	-0.119	0.414**	-0.031	-0.280**	1		

Cap	-0.061	-0.033	0.105	-0.084	-0.231	-0.012	1	
RD	0.352**	0.005	-0.170	0.182	-0.017	-0.162	0.303	1

Note: *, ** and *** represent the significance on the level of 10%, 5% and 1%, respectively.

The data in Table 4 shows that both the education level and the length of work of technical manager are positive related with innovative performance significantly in manufacturing industry, indicating the education and experience of technical manager are important in the industry.

Table 5 The correlation analysis about the information industry

variable	Patent	Age	Degree	Year	Share	People	Cap	RD
Patent	1							
Age	-0.011*	1						
Degree	0.125*	-0.407	1					
Year	0.306*	0.358	-0.187	1				
Share	0.149	-0.126	-0.065	-0.100	1			
People	0.090	-0.209	0.021	0.173	-0.180	1		
Cap	0.557**	-0.200	0.010	0.058	0.197	0.013	1	
RD	0.468**	-0.237	0.114	0.016	0.128	0.019	0.812	1

Note: *, ** and *** represent the significance on the level of 10%, 5% and 1%, respectively.

The data in Table 5 shows that the age of technical manager is negative related with innovative performance, but the education level and experience is positive related with innovative performance, both of them are significant on the level of 10%. Coming the result of Table 3, Table 4 and Table 5, it shows that the education level and the experience (or the length of work) of technical manager would improve the innovative performance, which has practice meanings for tech companies.

B. The characteristics of technical manager on financial performance

The characteristics of technical manager not only have impacts on innovative performance, but also on financial performance. With the sample and data, we set up a model about the relationship between the characteristics of technical manager on financial performance after trying to use different models. Table 6 is the result.

Table 6 The influence of technical manager on financial performance

Model	Nonstandardized coefficient	t	Sig.	Total linear statistics	
				tolerance	VIF
C		0.125	0.901		
Age	-0.059	-0.975	0.331	0.861	1.162
Degree	0.058	1.016	0.311	0.976	1.025
Year	0.188	3.134	0.002	0.869	1.151
Cap	0.616	10.944	0.000	0.988	1.012

The data in Table 6 shows that there is no total linear problem in the model. According to the model, only the length of technical manager has positive impacts on financial performance significantly, which supports the hypothesis H6 of the paper.

V. Conclusion

With the development of science and technology, manager, especially the technical manager, become more and more important in the process of innovation and production of enterprise. However, literature lacks of the research about the relationship between the characteristics of technical manager and both of the innovation performance and financial performance. Based on the sample of Shaanxi private technological enterprise of China, the paper makes an empirical study about the impacts of characteristics of

technical manager on performance. It shows that the length of work of technical manager is positive related with innovative performance and financial performance, the education level of technical manager also has positive impacts on performance in manufacturing industry and information industry, but the age of technical manager has not significant impacts on performance of company. Therefore, stressing on the length of work and education level of technical manager is important to improve both the innovative performance and financial performance.

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