

Doctoral Innovation Ability and Innovation Performance Evaluation Model

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Abstract—"Doctoral Innovation Ability" and "Innovation Performance Evaluation" are two concepts which are closely related but completely different. The research on the nature of the innovation ability and the innovation performance shall be born in mind to establish their evaluation model respectively. The evaluation model of the doctoral innovation ability will be established in this research based on the analysis of the ability structure and its static and dynamic influencing factors. This research claims that the strong innovation ability does not mean the high innovation performance certainly, since there are many other factors between the both sides. "Innovation potential" and "appeared innovation ability" together constitute the "innovation ability" producing visible and quantifiable "innovation performance" in given conditions. The relationship between the "innovation ability" and the "innovation performance" will be analyzed, with the innovation performance evaluation model set up.

Keywords-doctoral innovation ability; innovation performance; evaluation model

I. INTRODUCTION

Since the 18th CPC National Congress, General Secretary Xi Jinping has mentioned "innovation" in public speech so frequently, or over a thousand times according to incomplete statistics. It follows that how important innovation is in building an innovative country. Xi Jinping (2013)^[1] claimed that only the reformers and innovators would emerge stronger and win in the fierce international competition. And he (2015)^[2] also made it clear that innovation must occupy a central place in China's development strategy. Doctoral education is put at the top of the higher education, representing the main channel for training senior professionals^[3]. The doctoral innovation ability is crucial to measure the corresponding level of a country. Luo Yingzi et al. (2012) believed that the doctoral innovation ability resulted from interactions among multiple educational factors^[4]. This paper renders the discussion and research of the doctoral innovation ability and innovation performance, intending to establish the doctoral innovation ability and innovation performance evaluation model so as to support such assessment theoretically.

II. THE ORIGIN OF THE PROBLEM

The "innovation ability" and "innovation performance evaluation" are two concepts which are closely related but completely different. Some often use them indiscriminately, or subjectively believe that the strong innovation ability certainly comes with high innovation performance.

The innovation ability reflects the possibility to create the innovation performance that results from the ability playing a role in the innovation process. Among a sea of factors, the innovation ability emerges as the most important one having an impact on the performance in many cases. This paper focuses on the relationship between the doctoral innovation ability and the innovation performance.

The research on innovation theory has turned up for nearly a century, but its varied focuses have not yet formed the system of innovation theory in the academic circle so far. American economist Joseph Schumpeter first put forward "Innovation" in 1912, defining it economically^[5]; Chinese scholar Sanduo Zhou claimed that "innovation" was the basic function of management in such science area^[6]; Whitehead, British philosopher, set forth "innovation" philosophically and advocated that it was an intellectual adventure; the concept of the innovation ability was first proposed by Burns & Stalker (1961); while the innovation ability explicit theory was first raised by Amabile (1983)^[7].

As an old Chinese poem goes, "regard as Mountain Ranges Horizontally and Incline into a Peak Height of Distance is Variant." The research on innovation from different angles and levels in the academic field demonstrates that the common ground is not reached in this circle on the one hand; and reflects the complexity and obscurity of the problem itself indirectly on the other hand. Innovation enjoys no certainly fixed pattern or inexorable path, thus the innovation ability perhaps can not be lumped under one head. The analysis of the innovation ability must be characterized naturally by diversification, multi-dimension and multilevel, just as innovative thinking is marked by divergence.

This research itself does not intend to define a string of concepts regarding innovation, since we hold that no matter how the connotation of "innovation" is interpreted, only the relationship between the "innovation ability" and the "innovation performance" is compared in the same conceptual level. This paper puts emphasis on the research of innovation in the light of the innovation ability, the innovation performance evaluation model and their relationship.

In fact, the strong innovation ability underpins the high innovation performance, but the doctoral candidate with strong ability may not be bound to produce high output. The important issue is how to evaluate the "innovation ability" and the "innovation performance". Doctoral innovation practice can be individual or multiple activities, leading to difficult, general research on the "innovation ability" and the

"innovation performance" of multiple bodies in the whole innovation activity. That is why this paper only focuses on individual doctoral "innovation ability", "innovation performance evaluation" and their relationship. But the research regarding multiple bodies can be furthered in the future.

The doctoral innovation ability and the innovation performance evaluation model shall be born in mind to analyze and study their influencing factors in ways that establish a foundation for further study of the path by which the former affects the latter.

III. DOCTORAL INNOVATION ABILITY EVALUATION MODEL

Generally, the ability refers to the subjective condition necessarily required for the successful completion of an activity. But the ability is always linked with individual behavior. Innovation is not only a kind of complex thinking activity, but also a practical one. The innovation ability must be associated with innovation behavior, with innovation coming only through action. The individual innovation ability may fail to be manifested or enhanced without the specific innovation behavior.

We intend to limit the research scope of the "innovation ability". And we believe that the innovation ability is composed of two factors. The first one represents the main body of innovation, which refers to the general doctoral potential quality, namely the innovation potential; the second one goes to the appeared doctoral innovation^[8]. (See Table I) The innovation ability is just the one makes the innovation performance possible, as well as quality basis or crucial condition instead of the reality.

TABLE I. ENGLISH LOGOGRAM OF INNOVATION ABILITY 'S FACTORS

English Explanation of Innovation Ability 's factors	English logogram
Doctoral innovation ability	I
Potential doctoral innovation ability	P
Appeared doctoral innovation ability	A
Innovation quality	Q
Release space	S
Innovation behave	B
Subjective effort degree effectively	E

The research indicates the doctoral innovation ability model as follows:

$$I = f(P, A) \quad (1)$$

$$P = f(Q, S) \quad (2)$$

$$A = f(B, E) \quad (3)$$

The model is more intuitive to reflect the dimensions of doctoral innovation competence.

The "innovation potential" and the "appeared innovation ability" together constitute the "innovation ability" producing visible and quantifiable "innovation performance" in given conditions. The doctoral candidate with strong innovation

potential often boasts the strong innovation ability, so does those with strong appeared innovation potential.

According to the formula (1), (2) and (3), in two influencing factors of the doctoral innovation ability, the innovation potential represents the innovation quality of the doctoral candidate himself, which means the innovation potential energy shaped within the some release space, namely an innovative trend with relative stability as well as a static factor affecting the doctoral innovation ability; the appeared innovation potential has a close tie with the innovation behavior itself. It is not only subjectively influenced by the main body of innovation, but also objectively influenced by the practice process of the innovation behavior. It emerges as a dynamic factor to affect the doctoral innovation ability for its changing in the innovation process.

In order to improve the innovation ability, the above two factors must be changed, which refers to improve the innovation potential and the appeared innovation ability. The given body of innovation (i.e. the doctoral candidate), the static factor, namely the innovation potential, is relatively stable, thus we must focus on how to change the dynamic factor when studying the way to improve the innovation ability, that is changing the appeared innovation potential to improve innovation ability.

IV. DOCTORAL INNOVATION PERFORMANCE EVALUATION MODEL

The innovation ability is the prerequisite and basis for the doctoral candidate to engage in innovation, probably ensuring the well innovation performance; as a catalyst, the incentive promotes the possibility to the reality, playing a significant role as a necessary condition in promoting the innovation performance to a good one; and the innovation platform serves as an important condition for the doctoral candidate to achieve the innovation performance. In this connection, the innovation ability, the innovation platform and the innovation incentive are crucial to affect such competence into the innovation performance. Lv Hongyan (2013)^[9] put forward that it was necessary for colleges and universities to create a supportive environment in ways that encouraged and rewarded innovative efforts. This proposal was also motivated by incentive considerations.

A certain innovation, coupled with some innovation platform, can produce well innovation performance. (See Table II):

TABLE II. ENGLISH LOGOGRAM OF INNOVATION PERFORMANCE 'S FACTORS

English Explanation of Innovation Performance 's factors	English logogram
Doctoral Innovation performance	X
Doctoral innovation ability	I
Doctoral Innovation platform	F
Doctoral Innovation incentive	C
University Innovation platform	U
Provincial Innovation platform	P
National Innovation platform	N
Achievement motivation	M
Development opportunity incentive	O
Available resources incentive	R

The research indicates the doctoral innovation performance model as follows:

$$X=f(I, F, C) \quad (4)$$

$$F=f(U, P, N) \quad (5)$$

$$C=f(M, O, E) \quad (6)$$

As discussed earlier, the innovation performance has a positive correlation with the innovation ability in the formula (4), which means the strong latter producing the high former as the basis; the innovation platform also has a positive correlation with the innovation performance, which means the good former producing the high latter as a reliance; for the doctoral candidates, the innovation incentive has a positive correlation with the innovation performance, which is about the more incentives, the higher performance theoretically in other given conditions.

In the formula (5), the innovation platform contains the school-level, provincial and national one. Relying on the innovation ability of individual doctoral candidate plays a role of various innovation platforms in enhancing the individual doctoral self-innovation ability as an important path. The type of the innovation platform can be classified in different methods, but this study will center on its hierarchy classification.

In formula (6), the doctoral incentive level has a positive correlation with achievement motivation, development opportunity incentive and available resources incentive respectively. Such stimulation plays a role in improving the innovation performance based on the innovation ability. Only when the doctoral candidate has a certain innovation ability can the motivation incentive enhance the individual doctoral innovation performance significantly.

V. IDEAS FOR FURTHER RESEARCH

The above analysis indicates that the innovation performance of the doctoral candidate is affected not only by his innovation ability, but also by another two factors: the "innovation platform" and the "innovation incentive".

The research on three factors having an effect on the doctoral innovation performance has a great significance in studying and exploring the path for its improvement.

There are limitations to the established model, since this paper is defined only on the model establishment of the innovation ability and the innovation performance of individual doctoral candidate. There is no depth explanation and further analysis, since this model is just the preliminary and broad-brush vision. We believe that the further research on this issue needs to follow the following respects:

- Can the model established for individual doctoral candidate be applied to multiple, complex bodies? How should the model be modified if it is applied?
- How should the functional relationship between variables be determined in the doctoral innovation

ability and the innovation performance evaluation model?

- How each variable goes for further measurements and calculations. How should the qualitative variables be quantified?

There will be in-depth research on above problems in the later period.

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