

The Effects of Obstructive Factors and Rewards Related to Technological Innovation on Management Performance: Focusing on Chinese Companies

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Abstract

Background/Objectives: This study empirically analyzed the factors relevant to the effects of Obstructive factor and rewards on Technical performance and Image, management performance.

Methods/Statistical analysis: In this study, PLS, a analytic method, was used among other structural equation models. PLS is not structurally strict and helpful in analyzing models at the early phase of developing theories despite incomplete models. This study conducted online survey among Chinese companies.

Findings: Rewards gave positive effects on technological performance and images. Furthermore, technological performance showed the same effects on images and performance. Images gave the same effects on business performance.

Improvements/Applications: This study demonstrated the important relationship between obstructive factors and rewards, technical performance and image, which will serve as a guideline for further management performance.

Keywords: obstructive factors, rewards, technical performance, image, management performance

1. Introduction

The first industrial revolution had brought many changes to human life. Following the second and third industrial revolutions, a new trend based on the Information and Communication and Technology (ICT) has taken on the global stage: the Fourth Industrial Revolution. This cutting-edge movement employs Artificial Intelligence (AI): big data, Internet of Things (IoT): Cloud, 5G mobile, blockchain technology, Virtual Reality and Augmented Reality (VR · AR) and hyper-detection sensor technology. Such essential technologies are applied in and connected with pre-existing industries covering robot, automobile, factory and medical service (Li et al., 2019; Park et al., 2019; Park et al., 2018).

Such new trend demonstrates the importance of technological innovation. In the viewpoint of customers, it makes life abundant and meaningful. Businesses recognize that such technological innovation is a source of advantage that promotes the creation of new markets. Thus, it is a significant element directly tied to the survival of companies.

Companies make various attempts to survive the fierce competition by developing new source technologies and releasing new products and services. Innovation drives such changes. In doing so, companies are exerting more efforts to survive such competitive conditions. In a bid to successfully and effectively bring success to such innovation, many people make joint efforts. They should reinforce positive aspects and remove negative ones to reach successful levels.

Obstructive factor refer to diverse activities that interrupt innovations led by companies. Rewards boost their strengthened efforts toward innovation. Rewards, regarded as a positive element, are classified into monetary reward and non-monetary reward (Park et al., 2013). The monetary reward can serve as an obstructive factor to pushing ahead with innovation, while non-monetary reward boost innovation yet considers the possibility of drawing poor results.

Under the current circumstances where globalization is being accelerated, there is no borderlines and geographical merits. As technology advances, companies are pushed by more competitive situations. To survive it, they will exert more efforts in investing funds in technological innovation.

Despite such efforts, many earlier studies mainly focused on factors affecting technological innovation. There is little

research on the effects of obstructive factor and rewards related to technological innovation on management rewards. This study will examine the effects of obstructive factor and rewards on technological performance, images and business performance.

2. Theoretical Background

2.1 Technological Innovation

Schumpeter (1934) mentioned “creative destruction” as technological innovation (Schumpeter, 1934). Based on his research, Schmookler (1966) categorized technological innovation into product innovation and fair innovation (Schmookler, 1966). Freeman (1982) defined it as commercial transaction on new products and components from fair system (Freeman, 2013). Damanpour & Evan (1984) said that it brings change to organizations through the application of new products, services, systems, process, programs and instruments into organizations (Damanpour and Evan, 1984).

Rogers (1995) defined it as technological process through which new products are made, products are changed and process is evolved. In other words, technological innovation can be said to completely shift existing methods or organizations in terms of technology (Rogers, 2002).

2.2 Obstructive Factor

Stefflre (1985) analyzed obstructive factor in technological innovation implemented by organizations (Stefflre, 1985). Later on, Veugelers & Cassiman (1999) suggested that diverse obstructive factor arising from technological innovation interrupt such activities and that these obstructive factor play a decisive role in selecting and utilizing strategies for acquiring essential skills (Veugelers and Cassiman, 1999).

Mohnen & Rosa (1999) argued that there are a wide range of obstructive factor such as feasibility in implementing corporate innovation, market risk, excessive costs, financing, resource availability for carrying out innovation, internal resistance and regulatory environment (Mohnen and Rosa, 1999). Baldwin & Lin (2002) analyzed the effects of obstructive factor associated with expense, institution, personnel, organization and information on the adoption and use of new technologies (Baldwin and Lin, 2002). They noted that companies confront various obstructive factors in the process of innovation. They added that the more innovative they become, the more they face obstructive factor.

Galia & Legros (2004) noted the difference of obstructive factor between postponed projects and abandoned projects (Galia and Legros, 2004). They argued that the obstructive factors are correlated to seek tangible policy packages aimed at encouraging companies to take part in such innovation. Mohnen & Roller (2005) confirmed that the complementary and alternative associations of obstructive factor vary according to preference and degree of innovation, and that the level of obstructive factor differs depending on corporate and industrial characteristics (Mohnen and R öller, 2005).

Park et al. (2013) analyzed the influential factors between patent activities and management. They argued that rewards affect cooperation, and cooperation significantly affect obstructive factor (Park et al., 2013). In addition, the obstructive factor s gave a significant impact on technological images, and these images affected corporate images and performance.

2.3 Reward

A theory of learning notes that reward is a statically reinforcing element that causes positive behaviors. Such rewards include materials such as monetary benefits, food and clothes, or non-materials such as praise, acknowledgement and expressing gratitude. Rewards from certain behaviors serve as reinforcing agents, thereby increasing the possibility of reiterating the same acts under similar circumstances.

Jaworski and Kohli (1993) suggested that rewards are important instruments to form waiters' behaviors (Jaworski and Kohli, 1993). Park et al. (2013) said that in case companies give proper rewards to employees, patent-related activities will be revitalized, boosting cooperation and sharing information with the employees (Park et al., 2013). Thus, fair and appropriate rewards boost technological innovation, positively affecting technology and business performance (Uzochukwu and Uchenna, 2019); (Wen and Liao, 2019).

2.4 Technological Performance

Outcomes from implementing innovative measures generally lead to tangible and various results such as technological performance, economic rewards, product rewards and business performance (Park et al., 2013). The examples include the development of new technologies, release of new products and services and shortening the period of developing new technologies through technological innovation.

2.5 Image

Images are sensory phenomena resonated by senses. Companies regard it as special loyalty such as brand, company and technology distinct from other competitors (Park et al., 2013). Many businesses are making various efforts to enhance such brands. For instance, they highlight technological advantages such as developing and releasing first-ever new products to consumers, thereby garnering their loyalty to companies and their brands.

2.6 Management Performance

Neely et al. (1995) said that measuring business performance is a process of assessing the efficiency and effectiveness of business management (Neely et al., 1995). They added that rewards measuring index is a combination of instruments for assessing the efficiency and effectiveness. They attend to fulfill financial performance with only past invalid information regardless of a traditional performance: improvement of future performance.

Some scholars suggested considering both financial statements and non-financial measurements, underscoring the need to see the viewpoints of company, innovation, learning and customers in addition to financial aspects (Kaplan and Norton, 2001). Acha (2000) classified technological innovation abilities into research and development expenses and patent, and proposed the relevance with business performance (Acha, 2000).

3. Research Model and Hypothesis

In this study, obstructive factor and rewards were set as independent variables. The correlations were statistically analyzed by setting technological performance and images as mediating variables, and management performance as dependent variables. The research model was shown in the Figure 1. Hypotheses are shown as follows.

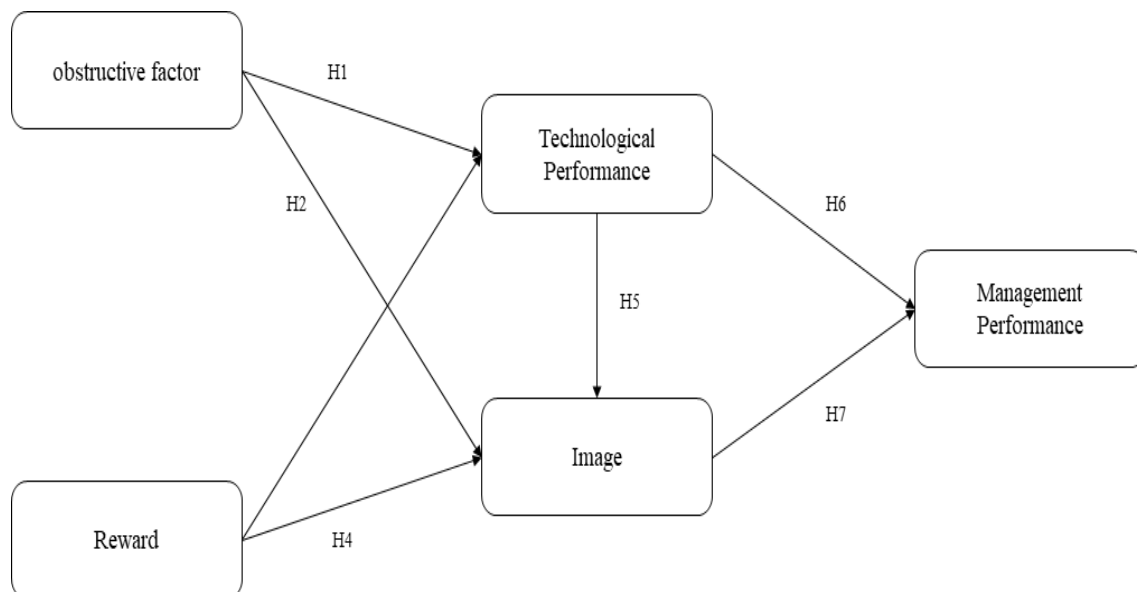


Figure 1. Research models

Companies make huge investments in technological innovation. Many of them undergo difficulties in the process due to multiple obstructive factor. Identifying and addressing such challenges would give a positive impact on their images and rewards. The following two hypotheses are shown.

H1. Obstructive factor in technological innovation will positively affect rewards.

H2. Obstructive factor in technological innovation will positively affect images

Companies with an appropriate and fair reward system encourage employees, laying a groundwork for growth. Samsung distributes annual surplus to employees in the early days. Employees are encouraged to facilitate innovation through monetary rewards. To be sure, companies capable of balancing non-monetary rewards and monetary ones will give positive effects on technological performance. In this sense, two hypotheses were shown as follows.

H3. Rewards coming from technological innovation will give a positive impact on technological performance.

H4. Rewards coming from technological innovation will give a positive impact on images.

Technological performance positively affects improving corporate images. These rewards encompass generating patent, practical methods, management secrets and copyrights out of the outcomes of research and development. Such technological performance and contributions demonstrate the leadership role played by businesses, ultimately giving positive effects on management performance. Technological performance through innovation would positively influence corporate images and performance. In this sense, two hypotheses were shown as follows.

H5. Technological performance will positively affect images.

H6. Technological performance will positively affect management performance.

Corporate images are regarded as identical with brand images. Thus, enterprises seek ways to enhance performance as well as images. Images such as brand, company and technology give a positive impact on their management performance. In this regard, a hypothesis was shown as follows.

H7. Images will positively affect management performance.

4. Results

4.1 Sample and Method

In this study, PLS, an analytic method, was used among other structural equation models. PLS is not structurally strict and helpful in analyzing models at the early phase of developing theories despite incomplete models. Furthermore, this statistic technique can be used to give optimally practical assessments to theoretically structural models and assessment models (Park et al., 2013; Chin).

This study conducted online survey among Chinese companies. In total, 172 participants responded at the survey held from September 1 to September 20, 2019. Except for four invalid responses, 168 papers were used in actual analysis. For genders, men accounted for 54.3% (108) and women accounted for 25.7% (60). As to academic background, high school accounted for 3.57% (6); college accounted for 76.79% (129); and graduate school accounted for 19.64% (33). In average, they worked for six years.

4.2 PLS Analysis

PLS requires standards such as internal consistency, convergent validity and discriminant Validity as part of validation. Internal consistency is validated using composite reliability and reliability. Internal consistency is deemed appropriate if composite reliability is over 0.8 and Cronbach's alpha ranges from 0.6 to 0.7. However, it is not a fixed index, yet vary according to participants and situations. Nunnally (1967) mentioned that over 0.5 is reliable (Nunnally, 1987). In this study, internal consistency was appropriate as all other variables, except for reward (0.5847): met standards. Discriminant Validity Analysis was shown in the Table 1.

Table 1. Discriminant validity analysis

	Factor Loading	Composite Reliability	AVE	Cronbachs' Alpha
IP1	0.7624	0.835	0.5587	0.737
IP2	0.7676			
IP3	0.7346			
IP4	0.7244			
OF1	0.8873	0.8843	0.6596	0.849
OF2	0.7458			
OF3	0.9114			
OF4	0.6814			
MP1	0.7977	0.7983	0.5699	0.6243
MP2	0.7774			
MP3	0.6849			

RE1	0.7631	0.7814	0.5439	0.5847
RE2	0.7187			
RE3	0.73			
TP1	0.7674	0.8052	0.5797	0.6397
TP2	0.7843			
TP3	0.7315			

AVE turned out over 0.5, and factor loading value was more than 0.6. Therefore, convergent validity is reliable (Fornell and Larcker, 1981; Thompson et al., 1995).

Table 2. Correlation between latent variable

	IP	MP	OF	RE	TP
IP	0.7475				
MP	0.5308	0.7549			
OF	-0.1241	-0.0593	0.8122		
RE	0.5612	0.4427	-0.1498	0.7375	
TP	0.5754	0.5949	-0.0446	0.4864	0.7614

Discriminant validity can be supported if AVE's square root marked on the diagonal axis must be bigger than the correlation coefficient below. The study revealed that discriminant validity is supported as the smallest value (0.7375) is bigger than the biggest value (0.5754) among other square roots (shown in the Table 2).

Table 3. Hypotheses testing

	Path	Coefficient	T-value	Result
H1	OF -> TP	0.0289	0.4913	Rejected
H2	OF -> IP	-0.0525	1.3951	Rejected
H3	RE -> TP	0.4907	12.0378***	Accepted
H4	RE -> IP	0.3597	5.4572 ***	Accepted
H5	TP -> IP	0.398	6.0663 ***	Accepted
H6	TP -> MP	0.4328	7.7863 ***	Accepted
H7	IP -> MP	0.2818	4.4969 ***	Accepted

It is effective for this structural equation model since it met all the three requirements. Table 3 and Figure 2 show the PLS results of this model. PLS R² showed that obstructive factor and rewards have explanatory power over 23.7% of technological performance and 43.7% of images. Both have explanatory power over 40.7% of management performance. These results are 10% higher than test power proposed by Falk and Miller (1992) (Chin and Todd, 1995; Falk and Miller, 1992).

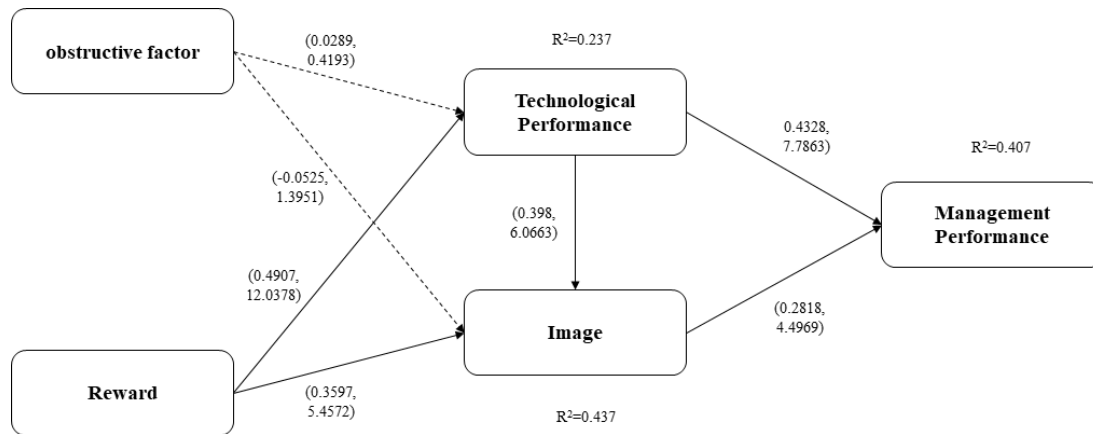


Figure 2. Hypotheses testing

The mediating effects are shown below.

First, the mediating effects of obstructive factor were null, which is consistent with the results of research hypotheses. Technological performance showed mediating effects of management performance. In addition, the same effects were found between image rewards and management performance. Sobel test showed that t statistics were $t=6.5348(p<0.05)$ and $t=4.4690(p<0.05)$: respectively.

5. Conclusion

As time progresses, technology advances in the course of innovation. In this era, we live in a rapidly changing society. In particular, business makes continued efforts to survive the Fourth Industrial Revolution era. Balancing obstructive factor and rewards would be more important than any other issue in a bid to achieve technological innovation successfully. Results are shown as follows.

Rewards gave positive effects on technological performance and images. Furthermore, technological performance showed the same effects on images and performance. Images gave the same effects on management performance (Windarti, 2019); (Woon et al., 2019).

It is vital for companies to accomplish technological performance by giving appropriate rewards to employees. In addition to technological performance, fair and appropriate rewards can enhance corporate images, ultimately positively influencing management performance. Nevertheless, the obstructive factor did not affect technological performance and images. Such results are assumed to be derived from Chinese corporate culture. Autonomy and equality in task are guaranteed by Chinese businesses. In addition, there are advantages such as rapid decision-making, various rewards and fast implementation. On this note, obstructive factor may not impede generating better performance. The implications are presented below.

First, many earlier studies focused on the effects of technological innovation and following performance. However, this study identified the association between obstructive factor and rewards, and between technological performance and images resulting from technological innovation among Chinese companies. Second, the findings are expected to be used as a guideline for Chinese corporate executives to carry out technological innovation.

In spite of these implications, the limitations should be mentioned. First, it failed to consider diverse variables influencing technological innovation and management performance. Second, it did not draw variables in terms of industrial characteristics. In the follow-up study, the number of survey participants should be increased. Various variables affecting technological innovation should be gathered and comparing other countries, in addition to China, needs to be implemented.

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