



Temporal cognition, environmental innovation, and the competitive advantage of enterprises



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ABSTRACT

Environmental innovation is an important way for enterprises to comply with environmental regulations and satisfy consumer demands. Based on a review of the relevant literature, this study examined the relationships among temporal cognition, environmental innovation, and the competitive advantage of enterprises along the logic of ‘cognition-behaviour-performance’, also incorporating environmental dynamism into the research model from a contingency perspective. A total of 219 enterprises in China’s manufacturing industry were selected as the study sample. Hierarchical regression analysis and Sobel testing yielded the following results: long-term orientation had a positive effect on environmental product innovation and environmental process innovation, whereas polychronicity had a positive effect only on environmental process innovation; environmental process innovation was conducive to the enterprise acquisition of advantages of low cost and differentiation, whereas environmental product innovation can only improve the differentiation advantage. This study also concludes that environmental dynamism positively moderates the relationship between environmental process innovation and the differentiation advantage. This paper may contribute scientific value to stakeholder theory and cognition theory.

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1. Introduction

Environmental innovation, also known as green innovation and eco-innovation, refers to new and improved processes, equipment, products, technology, and management systems for preventing or reducing damage to the environment (Kemp et al., 2001). With increasing government attention to environmental problems and the continual increase in market demands for environmentally friendly products, environmental innovation results in a “research and development spillover effect” and “environmental externality” (Rennings, 2000), which has caused environmental innovation to gradually become an important method for enterprises to comply with environmental regulations and satisfy consumer demands (Ghisetti and Rennings, 2014; Przychodzen and Przychodzen, 2015). Therefore, scholars in China and worldwide have initiated a significant amount of research on environmental innovation from various perspectives.

However, a review of the previous literature finds gaps in prior research on environmental innovation in three areas. First, prior

research has mainly addressed the effects of factors such as environmental regulation and stakeholder pressure on environmental innovation, neglecting the effects of the enterprises’ own cognition (e.g., Brunnermeier and Cohen, 2003; De Vries and Withagen, 2005). Second, in regard to the results of the effect of environmental innovation, previous scholars have devoted excessive attention to the relationship between environmental innovation and economic performance (Liao and Cheng, 2014); however, obtaining and maintaining competitive advantage is the core issue for enterprises. Past studies have been inadequate in addressing whether the various dimensions of environmental innovation have differentiation effects on competitive advantage. In addition, some studies have also viewed competitive advantage as a single dimension equivalent to corporate economic performance. Third, the studies by Zhang et al. (2013) and Zhang (2007) have also confirmed that environmental dynamism plays a moderating role in the ‘behaviour-performance/competitive advantage’ relationship, but the moderating direction is indeterminate, and the study conclusions are vastly different.

In relation to the industrial structure and resource-based theories (Hart and Dowell, 2011), there are limitations in explaining corporate behavioural choice and performance. Hambrick and

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Mason (1984) propose the upper echelon theory and argue that organisational behaviour and performance reflect the values and cognition of upper-level managers; in particular, cognition plays a positive role in forecasting an organisation's choice of strategic behaviour and performance. Temporal cognition is an important variable of the corporate cognitive perspective and one of the core variables; it plays a positive role in explaining the formulation of corporate strategic plans and the adoption of decision-making behaviour (Lumpkin and Brigham, 2011). Therefore, to compensate for the gaps in prior research, this study considers the influence of temporal cognition on the environmental innovation of enterprises from a cognitive perspective, emphasises investigating whether environmental innovation is conducive to obtaining and maintaining corporate competitive advantage, and, simultaneously, examines the moderating role of environmental dynamism in the relationship between the two.

2. Research hypotheses

2.1. The effect of temporal cognition on corporate environmental innovation

Time is an abstract concept, and studies on time can be divided into four categories: physiological time, objective time, psychological time, and socially constructed time (Tuttle, 1997). For example, according to the view of objective time, time is measurable, scarce, divisible, etc. (Hay and Usunier, 1993). Cognition refers to the interpretation and processing process applied to the acquired information (Walsh, 1995; Swan, 1997). Therefore, temporal cognition can be described as one's mental process of understanding the characteristics of time.

Past studies regarding time's characteristics mainly focused on its 'economics' and 'monochronicity/polychronicity'. In terms of economics, time is a scarce resource; according to an objective view of time, it is a type of economic good that can be conserved or wasted. Therefore, time should be strictly controlled and allocated, and the temporal cognition of long-term orientation/short-term orientation is thus generated (Tuttle, 1997). Monochronicity/polychronicity describes a preference for engaging in one activity at a time or doing various things simultaneously. Therefore, a concept of monochronic time follows a schedule, whereas a concept of polychronic time does the exact opposite (Hay and Usunier, 1993; Voss and Blackmon, 1998), and the temporal cognition of a concept of monochronic time/concept of polychronic time is thus generated. Therefore, temporal cognition can be divided into two aspects: long-term orientation/short-term orientation and monochronicity/polychronicity.

2.1.1. The effect of long-term orientation on environmental innovation

Saini and Martin (2009) indicate that, as a corporate concept of time, long-term orientation essentially means that the future is more important than the present; the enterprise adopts a long-term focus rather than a short-term focus in its strategy and is more concerned with long-term actions than short-term benefits. Compared with short-term oriented enterprises, long-term oriented enterprises face less time pressure, and corporate programmes and activities are given more time to generate results; thus, long-term oriented enterprises have lower levels of misconduct (Johnson et al., 2012). Clayton et al. (1999) argue that environmental innovation is a special category of activities that expends fewer resources, generates less waste, and produces less environmental damage through development, thereby reducing the negative external influence on the environment. Environmental innovation is a manifestation of corporate achievement in long-

term development and an effective method for enterprises to avoid misconduct caused by traditional technological innovation; for example, although traditional technological innovation yields new technological advances, it also produces certain negative effects. Long-term oriented enterprises are thus more willing to adopt environmentally innovative behaviour. Therefore, this study proposes the following hypotheses:

H1a. *Long-term orientation has a positive effect on environmental product innovation.*

H1b. *Long-term orientation has a positive effect on environmental process innovation.*

2.1.2. The effect of polychronicity on environmental innovation

The concept of polychronic time describes a preference for engaging in multiple activities simultaneously or doing multiple things in parallel and a belief that such a preference is the best way to address matters; here, 'simultaneously' indicates that the number of tasks is more important than how the tasks are completed (Bluedorn et al., 1999; Conte and Jacobs, 2003). Compared with technological innovation, environmental innovation involves more contents or activities; for example, environmental innovation devotes more attention to the protection of the environment, conservation of resources, and discharge of hazardous waste. Therefore, compared with enterprises embracing a concept of monochronic time, those with a concept of polychronic time tend more towards the adoption of environmentally innovative behaviour and believe they are better in innovative activities. Therefore, this study proposes the following hypotheses:

H2a. *Polychronicity has a positive effect on environmental product innovation.*

H2b. *Polychronicity has a positive effect on environmental process innovation.*

2.2. The effect of environmental innovation on corporate competitive advantage

2.2.1. The effect of environmental innovation on the competitive advantage of low cost

According to the perspective of Porter and Van der Linde (1995), environmental innovation is conducive to obtaining the competitive advantage of low cost. Prior research reports the following reasons as the main basis: firstly, enterprises that adopt environmental innovation use fewer raw materials. Through the reasonable use of existing resources or development of the use of new environmentally friendly materials, enterprises can reduce energy and material consumption. Secondly, within the context of the current strict policy environment, enterprises face a continual rise in standards for pollutant discharge fees; severe punishment; and other problems. One of the main characteristics of environmental innovation is a reduction in the generation of waste water, discarded waste, and waste materials, which provides enterprises with the possibility of reducing pollutants to levels below the requirements, in turn lowering corporate cost related to environmental compliance and responsibility (Eiadat et al., 2008; Hart, 1995). Thus, this study proposes the following hypotheses:

H3a. *Environmental product innovation has a positive effect on the competitive advantage of low cost.*

H3b. *Environmental process innovation has a positive effect on the competitive advantage of low cost.*

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