



Determinants of firm innovation in Singapore

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Abstract

Despite the numerous studies on the topic of innovation, there is still a lack of consensus as to a single definition. By taking the broadest view of the term, this study considers innovation as a process that involves the generation, adoption and implementation of new ideas or practices within the organization. Using data from 71 companies in Singapore, this study examines the relationship between firm innovation and six of its potential determinants. The results indicate positive and significant relationships between organizational innovation and (1) decentralized structure; (2) presence of organizational resources; (3) belief that innovation is important; (4) willingness to take risks and (5) willingness to exchange ideas.

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1. Introduction

Innovation has always played a critical role in predicting the long-term survival of organizations (Ancona and Caldwell, 1987). Indeed, many well-known leading authorities on business, including Fortune 500 CEOs and academics alike, have paid tribute to the importance of innovation in determining an organization's success (Higgins, 1995). For example, Porter (1990) comments that innovation, continuous improvement and change are the three cornerstones of global competitiveness. A 1998 Global Innovation Survey of 669 companies spanning 10 industries by the consulting firm Arthur D. Little revealed that 84% of the respondents strongly believed that innovation was critical to the future success of their firms (Straits Times, 5 December 1998).

Singapore is now in the developed nations league, which includes countries such as the US and Japan. Innovation will play an increasingly important role in the country's future growth. The government has set up a Singapore \$ 500 million Innovation Development Scheme (IDS) to promote the country as an innovation hub. This scheme provides grants to companies that wish to undertake innovative activities (Aggarwal, 1995). This has enhanced

the innovative environment in Singapore. In particular, there have been 480 innovation projects that received grants from the scheme, with 350 awarded to local companies and the rest being multi-national companies (MNCs) (Long, 1999). At the same time, the government service in Singapore is encouraging innovation throughout the organization by creating the position of a chief innovation officer within the civil service (Liang, 2001).

We undertook this study with the primary aim of extending the stream of innovation research from the Western hemisphere to Singapore. The results will provide companies operating in Singapore with useful information on how their policies and actions might affect firm innovation. The lack of natural resources in Singapore has forced managers to make more innovative and more effective use of their human capital. They have been successful so far but the new millennium poses even greater challenges for managers, professionals and workers alike. As such, knowledge of the factors contributing to greater innovation can help to ensure the continued success of these enterprises.

2. Theoretical developments and hypotheses

2.1. Innovation

We begin this section by examining the definition of innovation, the dependent variable for the study. Despite

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the numerous studies on the topic of innovation, there is still a lack of consensus as to a single definition. This is most likely due to the difficulty in settling upon an agreed upon method to measure innovation (Ravichandran, 1999). Innovation research is further complicated when researchers further broke innovation down to different types/categories.

1. *Technical and administrative innovation*: Daft (1978) proposed that innovation could be classified as technical and administrative innovation. The technical aspect refers to products, services and production processes that are at the core of an organization's technical ability (Daft, 1978; Damanpour and Evan, 1990; Knight, 1967). As for administrative innovation, it refers to innovations that are generated from the managing and alteration of an organization's structural and administrative procedures (Daft, 1978; Damanpour and Evan, 1990; Kimberly and Evanisko, 1981; Knight, 1967). These two forms of innovation vary in importance depending on the innovation needs of an organization, whether it is technical or administrative and whether the organizational structure is mechanistic or organic (Daft, 1982).
2. *Product and process innovation*: Product innovation deals with the production of new products and services to create new markets/customers or satisfy current markets or customers. Process innovation is reflected in the improvements or introduction of new production process for products or services (Knight, 1967; Utterback, 1971). In this typology, there is no research available on how they are affected by organizational variables and organizational needs (Damanpour, 1991).
3. *Radical and incremental innovation*: Radical innovation brings about a non-routine but clear change to the very core on how activities are carried out while incremental innovation is usually part of routine changes that do not deviate much from present organizational activities (Dewar and Dutton, 1986; Ettlie et al., 1984). No dominant explanation has been adopted to explain when an organization adopts radical or incremental innovation (Damanpour, 1991).

In summary, although the three categories of innovation are different definitions in their own right, they do overlap and the various types of innovation have varying degrees of importance depending on the environment an organization is operating in (Damanpour and Gopalakrishnan, 1998). This further complicates the innovation concept as there are now too many different definitions in the diverging studies on innovation and this makes the search for one even more complicated (Downs and Mohr, 1984; Ravichandran, 1999).

By taking the broadest view of innovation, rather than an exact and specific definition for innovation which every academic can agree upon, this study considers innovation as a process that involves the generation, adoption, implementation and incorporation of new ideas, practices or artefacts within the organization (Van de Ven et al., 1989).

2.2. Determinants of innovation

We identified six determinants of firm innovation from our literature search. We shall cover them briefly.

2.2.1. Communication channels

Frequent internal communication has been argued to favour innovation because it facilitates the dispersion of ideas within an organization and increases their amount and diversity, which in turn results in a cross-fertilization of ideas (Aiken and Hage, 1971). Furthermore, such a structure is able to create an internal environment favourable to the survival of new ideas (Ross, 1974). Similarly, Nonaka's model of organizational knowledge creation suggests that it is through the interaction among individuals that leads to the "amplification and development of new knowledge". Through such interactions, tacit and explicit knowledge that is "produced by one part of the organization creates a stream of related information and knowledge, may in turn trigger changes in the organization's wider knowledge systems" (Nonaka, 1994: pp. 14–15). Thus, it is proposed that:

H1. Frequent internal communication is positively related to greater firm innovation.

2.2.2. Decentralized structure

According to Subramanian and Nilakanta (1996), there is a widespread belief that decentralized and informal organizational structures facilitate innovativeness. They propose that the flexibility and openness of these types of organizational structure help encourage new idea generation. Similarly, Kanter (1983) characterizes an innovative organization as one with reduced layers of hierarchy, greater lateral communication and greater empowerment to lower-level employees. On the other hand, the concentration of power in centralized organizations is believed to be a major obstacle to the adoption of innovations (Aiken and Hage, 1971; Thompson, 1965).

In Damanpour's (1991) meta-analysis of the relationship between organizational innovation and its potential determinants, he found statistically significant and negative associations between centralization of decision-making authority and innovation. Thus, we propose:

H2. Greater decentralization of decision-making authority is positively related to greater firm innovation.

2.2.3. Organizational resources

Organizational slack has been hypothesized to positively affect innovation as it allows an organization to purchase innovations, absorb failure, bear the costs of instituting innovations, and explore new ideas in advance of an actual need (Rosner, 1968). In a study that compared innovation successes and failures, it was established that the failures were handicapped by a lack of resources, while

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