



# Creative workforce density, organizational slack, and innovation performance

Chung-Jen Chen <sup>a,\*</sup>, Yi-Fen Huang <sup>b,1</sup>

<sup>a</sup> Graduate Institute of Business Administration, College of Management, National Taiwan University, 1, Sec. 4, Roosevelt Road, Taipei, Taiwan, R.O.C.

<sup>b</sup> Department of Business Administration, Dayeh University, 168, University Road, Dacun, Changhua, Taiwan, R.O.C.

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## ABSTRACT

This study examines the effects of creative workforce density and organizational slack on innovation performance. This article suggests an inverse U-shaped relationship between creative workforce density and innovation performance and proposes two governing forces relating to this relationship. Moreover, this study suggests that different slacks vary in affecting innovation. When adding absorbed and unabsorbed slacks as moderators, the relationship between creative workforce density and innovation performance becomes strengthened or attenuated respectively. Comprehensive secondary data on 305 Taiwanese firms in IT sector support the prediction. This article also discusses the managerial implications and highlights future research directions.

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## 1. Introduction

An organization's ability to continuously generate innovation is essential to achieve a sustainable competitive advantage in today's highly competitive business environment (Montes et al., 2004; Subramaniam and Youndt, 2005). The foundation of the innovation is creative ideas and individuals in the firms are those who discuss, generate, promote, and ultimately realize ideas (Scott and Bruce, 1994; Van de Ven, 1986). Firms that effectively leverage the pool of creative energy in house can elevate the innovative capabilities well beyond the incremental and mundane (Mascitelli, 2000). Accordingly, establishing a creative workforce to effectively tap the individual ideas toward creative results is a challenge for firms.

Owing to the increasing importance of creative workforce, scholars have paid attentions to exploring its impact on innovation. Prior studies in the group literature progress to investigate factors relating to workforce, such as diversity, leadership, structure, and climate that can affect innovation (e.g., Woodman et al., 1993; Nonaka and Takeuchi, 1995; Ofori-Dankwa and Julian, 2002; Paulus, 2000; King and Anderson, 1990; Janssen et al., 2004). However, few scholars explore the size effect of the creative workforce on innovation performance. This study primarily focuses on this issue and concerns the following questions: Is the performance-enhancing effect of the creative workforce linear? What is the appropriate level of the creative workforce for maximizing firm's innovation outcomes? Prior studies provide some clues about the relationship between the size of creative

workforce and innovation. Some scholars propose the positive benefits of larger size because of frequent dialogue and knowledge sharing (e.g., Nonaka and Takeuchi, 1995; Paulus, 2000; Egan, 2005; Mascitelli, 2000) while others suggest the negative impact of group size due to conflicts and coordination problems (e.g., Harrison et al., 1998; Jehn et al., 1999; Shapiro, 2000). These arguments imply that the size of creative people has bright and dark side effects on innovation and accordingly the relationship may be non-linear. Therefore, in present study, we suggest that these two forces would govern the relationship between creative workforce and innovation and would provide empirical evidences to support the prediction.

In addition, some researchers recognize the importance of slack resources for innovation and pay attentions to link the relationship between slack resources and innovation (e.g., Damanpour, 1991; Nohria and Gulati, 1996; Judge et al., 1997; Greve, 2003). In the process of innovation, resources act as inducements to experiment, take risks, and make proactive strategic choices. Organizational slack was recognized as a critical facilitator to promote experimentation by allowing uncertainty to be absorbed (Cyert and March, 1963; Nohria and Gulati, 1996; Keegan and Turner, 2002). In viewing innovation as output of a complex social system in which creative individuals interact with each other, some prior studies point out the possible contextual role of slack resources (Cohen and Levinthal, 1990; Damanpour, 1991; Woodman et al., 1993; Keegan and Turner, 2002). However, few prior studies try to examine how organizational slack moderate the firm's innovation process. Moreover, scholars often treat organizational slack uniformly from a theoretical standpoint (e.g., Nohria and Gulati, 1996), though operate organizational slack as a multi-component concept (e.g., Bourgeois, 1981; Singh, 1986; Bromiley, 1991; Geiger and Cashen, 2002; Tan and Peng, 2003). Some research has suggested that different types of slack may have different effects on innovation (e.g., Geiger and Cashen, 2002; Tan and Peng,

\* Corresponding author. Tel: +886 2 33669655.

E-mail addresses: chungjen@management.ntu.edu.tw (C.-J. Chen),

yifen@mail.dyu.edu.tw (Y.-F. Huang).

<sup>1</sup> Tel.: +886 4 8511888x3013.

2003). Distinguishing how different slacks influence the innovative activities is necessary and valuable (Nohria and Gulati, 1996). It is helpful to use a contingency perspective to specify the natures of different slacks when discussing their impacts on organizational outcomes (Cheng and Kesner, 1997; Tan and Peng, 2003).

Therefore, this study focuses on investigating the effects of creative workforce and different slacks, absorbed and unabsorbed, on innovation outcome. The rest of the article is set out as follows. The next section considers the previous literature and sets out the hypotheses of this study. Following that is the methodology for the study. Then, the article presents the results of the empirical study in achieving the goals as set out above. In the last section, the article discusses the managerial implications and highlights future research directions.

## 2. Hypotheses

### 2.1. Creative workforce density and innovation performance

Creativity is the raw materials necessary for innovation. Patented invention is an important form of creativity in which creative outputs are both carefully scrutinized and publicly available (Audia and Goncalo, 2007). Research on creativity has often used the frequency of patenting as a proxy of creativity (e.g. Audia and Goncalo, 2007; Ford and Harris 1992, Gilman 1992). Patent inventors are the creative employees within the organization who have enabling effects on the processes of knowledge creation and on the evolution of innovation capabilities (Nerkar and Paruchuri, 2005). A strong competitive advantage is conferred on organizations that are adept at eliciting creativity from their creative workforce. In high-tech sectors, such as information technology sector, patenting is important to protect competitive advantage and patent inventors are the main creative workforce with the firms. Accordingly, in this study, we define the independent variable “creative workforce density” as the relative size of creative personnel in a firm and measure it as the ratio of the number of patent inventors to that of total employees.

Prior researches in the group literature have found evidences that characteristics of creative workforce, such as network structure, size and diversity (Woodman et al., 1993; Nonaka and Takeuchi, 1995; Ofori-Dankwa and Julian, 2002; Paulus, 2000) are critical factors of creative output. Woodman et al. (1993) point out that group creativity is influenced by group composition (e.g., diversity) and group characteristics (e.g., cohesiveness, group size), implying that the interactions and flows of knowledge that take place across creative actors of an organizational network influence the creation of new knowledge. Nonaka and Takeuchi (1995) suggest that the increase of the diversity of creative individuals in work environment provides a platform to create and exchange diverse sources of original knowledge and experience. Paulus (2000) suggests that workforce at group and team levels with abundant and diverse cognitive capabilities in terms of skills, knowledge, abilities, and perspectives, is likely to be more creative and innovative. However, few studies in the group literature explore the size effect of creative workforce on innovation performance.

Some prior studies provide clues that a high-density of creative workforce can provide a rich source of original ideas, talents, and experience that is positive for innovation (e.g., Nonaka and Takeuchi, 1995; Walsh, 1995). Patent inventors are the creative people who possess unique tacit knowledge and learning capacity, embedded in a complex system of learning and social interaction within a firm. In the social architecture of a firm, knowledge is communicated predominantly through person-to-person contacts. Therefore, inventors who collaborate less should be less likely to patent (Audia and Goncalo, 2007). When frequent and intensive interactions among crew members take place, a collective knowledge structure is likely to emerge (Walsh, 1995). This collective knowledge structure can provide abundant sources of new knowledge and skills for individuals to learn and subsequently to utilize in the innovative activities. The

greater density of the creative workforce can aggregate to a richer knowledge structure to provide more knowledge exchanges and learning opportunities within the firm, thus contributes to organizational innovation outcomes.

However, high-density creative workforce may also have dark side effects on innovation. As the size of the workforce increases, interaction problems would become more complicated and costly, and thus negative to the innovation outcomes. A high-density creative workforce contributes to the organization not only a total pool of creativity-related skills, know-how, and perspectives, but also the potential for more comprehensive and creative innovation process via informational conflicts (Milliken and Martins, 1996; Simons et al., 1999). However, these conflicts are also likely to become a source of problems when creative workforce density reaches an excessive level due to the dissimilarity between the creative employees in the workplace. Experiences of dissimilarity are likely to give rise to factionalism, message distortion, and other communication difficulties that may impede the workforce to generate coherence (e.g., Harrison et al., 1998; Jehn et al., 1999; Williams and O'Reilly, 1998; Shapiro, 2000). When the workforce lacks the ability or willingness to discuss and resolve the disagreements, conflicts are likely to disturb the further development and implementation of the creative ideas and to harm the capability to innovate. In short, the dark sides of high-density creative workforce come from difficulties in communicating and coordinating effectively among creative individuals. Accordingly, the higher density of the creative workforce, the more costly would be to achieve effective communication and coordination among creative individuals, and thus negatively affect innovation outcome.

According to the above discussion of the bright and dark side effects of the high-density creative workforce, this article proposes that the relationship between creative workforce density and innovation performance is curvilinear. As these two related forces govern the relationship, an optimal level of creative workforce density for the innovation performance would exist. Before the optimal level, the creative workforce density would enhance innovation performance. On the other hand, innovation performance would decrease as the creative workforce density increases after the optimal level. In sum, this article expects that creative workforce density would have a curvilinear effect on innovation performance, which would first increase and then decrease when the density of creative workforce increases. The above reasoning leads to the following hypothesis.

**Hypothesis 1.** The relationship between creative workforce density and innovation performance is inverse U-shaped, with the slope positive at low levels of creative workforce density and negative at high levels of creative workforce density.

### 2.2. The moderating role of organizational slack

Although the relationship between creative workforce density and innovation performance should hold for all firms, the slope of the inverse U-shaped could vary in magnitude with specific firm characteristics. Therefore, we extend the initial proposition that there is an inverse-U shaped relationship between creative workforce density and innovation performance, by further proposing such a relationship may be strengthened or attenuated in different organizational settings.

Woodman et al. (1993) proposes that the innovation performance of the organization is a function of the creative performance of its constituent groups and salient aspects of the organization, such as resource availability, that can enhance or constrain creativity. Research on organizational innovation has long supported the notion that slack resources enable endogenous growth and innovation (Penrose, 1959/1995; Nohria and Gulati, 1996; Lawson, 2001; Greve, 2003; Pitelis, 2007). Organizational slack is the cushion of actual or potential resources which allows an organization to adapt successfully to internal pressures for adjustment or to external pressures for change in policy

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