

Contents lists available at [SciVerse ScienceDirect](#)

## Technological Forecasting &amp; Social Change

journal homepage:



## Social capital, absorptive capability, and firm innovation

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## ARTICLE INFO

## Article history:

Received 2 February 2012

Received in revised form 9 August 2012

Accepted 16 December 2012

Available online xxxx

## Keywords:

Social capital

Firm innovation

Network technological diversity

Absorptive capability

## ABSTRACT

The purpose of this study is to examine the relationship between social capital and firm innovation as well as the moderating effects of absorptive capability. In general, network-level technological diversity is utilized to measure a firm's social capital and in this case, an empirical investigation of 748 high-tech firms in Taiwan indicates that such diversity in a firm's social network has an inverted U-shaped relationship with the firms' innovation performance. In addition, we find that by increasing absorptive capability, it will systematically increase the slope and amplitude of the positive effects of diversity as well as maximize the overall value of network-level technological diversity for firm innovation performance. These results also suggest that an overabundance of network-level technological diversity can have a negative impact on firm innovation while a moderate level of such diversity can lead to high levels of innovation performance.

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## 1. Introduction

Intangible assets are crucial for a firm's overall success, especially in the current knowledge-based economy. By 2002, 75% of a firm's market value is due to its intangible assets, which shows that effective management of such assets is the key to achieving superior performance [1]. Discussions in regard to social capital, one such intangible asset, have recently gained prominence. Social capital is generally defined as the resources embedded in a social network that can be mobilized by a firm in order to increase the success rate for specific actions [2]. Previous studies have indicated that social networks are important channels for firms to access external knowledge. Through such networks, firms can obtain pertinent information and knowledge that helps them enhance their overall learning and innovation (e.g. [3–5]). Despite these positive aspects, there are several limitations in current research that restrict further understanding of how social capital can improve firm innovation.

First, few research consider the differences in social networks while studying the value of social capital for innovation (e.g. [6–8]). In fact, the composition of a firm's social network

influence the amount of resources and information a firm can obtain from its network [9]. Second, the majority of current research assumes that the relationship between social capital and innovation performance is linear (e.g. [10–12]). However, social network theory indicates that a non-linear relationship between social capital and firm performance is possible. Third, some recent studies have found that the benefits of social capital are contingent upon firm characteristics and contextual factors, which suggests that scholars must consider these factors when studying the value of social capital [13–16].

Therefore, this study aims to address the above limitations by examining how the composition of a firm's social network impacts the firm's innovation performance as well as investigating the moderating effects of absorptive capability. For this study, we utilized interlocking directorates in order to establish the boundary for a firm's social network while using network-level technological diversity to measure social capital. This particular investigation occurred between 2006 and 2008, and the subjects consisted of 748 high-tech firms in Taiwan, all of whom believed that innovation was a vital component of maintaining a competitive position. According to the results, there is an inverted U-shaped relationship between the technological diversity of a firm's social network and the firm's innovation performance. This shows that even though network-level technological diversity can

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help increase innovation, an overabundance of such diversity can adversely affect innovation performance. In addition, we found that absorptive capability increases the slope of the positive effects of network-level technological diversity as well as reduces the negative effects of such diversity. In other words, firms with greater absorptive capabilities benefit more from technologically diverse networks.

In addition, this investigation contributes to the literature and practice in several ways. First, it proves that the diversity of a firm's social network can influence its innovation performance. This means that more attention should be made toward network composition while studying the benefits of social capital. In practice, if firms want to increase innovation through alliance networks, they need to examine the member composition of the particular network in which they are embedded. Second, in previous literature, absorptive capability is considered as an important factor that influences firm innovation [17,18]. Since a limited number of studies have analyzed whether a firm's absorptive capability increases the overall value of its external network, this investigation provides preliminary evidence that shows how a firm's absorptive capability does in fact help the firm obtain and absorb external knowledge. In particular, the greater the diversity a network provides, the more absorptive capability is required. Based on this framework, a firm cannot simply rely upon external networks in order to obtain knowledge; it must also adequately invest in the development of its own technical capacity.

Many studies suggest that social networks provide channels for firms to obtain knowledge, resources and technology as well as promote internal learning in order to help them innovate [19–21]. However, there is hardly any consensus in the accompanying literature. In this case, this study also proposes that the relationship between social network and firm innovation is non-linear in an attempt to explain such inconsistencies and help firms realize that only with moderate investments in social capital can they obtain maximum value.

Finally, most of the current research on the relationship between social capital and performance has been conducted based on the individual [22], the project [23], or the industry itself [24,25]. It is only recently that studies have been conducted based on the organization or firm [9,26]. Therefore, the overall analysis in this study is conducted based on the firm in order to show that specific composition of interfirm networks are factors in the construction of social capital.

This paper proceeds as follows. Section 2 presents a literature review of previous social capital research, and derives two hypotheses for how network composition influences firm innovation. Section 3 provides descriptions in regard to the data and variables employed in the analysis while the empirical results are discussed in Section 4. Finally, Section 5 provides a discussion of the implications of this study and its overall limitations.

## 2. Theory and hypotheses development

### 2.1. Definition of social capital

Extensive discussions in regard to social capital began during the 1980s, and there are multiple definitions of this abstract concept. For example, according to Bourdieu [27],

social capital is the aggregation of actual and potential resources within a specific network, where the network is composed of relationships that involve mutual acquaintance and mutual recognition. Flap [28,29] defines social capital as the resources that the ego obtains from stable relationships or the accessibility and willingness of alternate relationships to provide such resources. However, most scholars agree that social capital is an investment of social relationships by an individual or organization expecting returns from the market [30–33]. More specifically, social capital is a resource that is embedded within the social network that can be mobilized by the actor (e.g., the firm or organization) in order to increase the success rate for specific actions [2].

According to this definition, social capital has two main characteristics: 1) it is embedded within the social network; and 2) it is a resource that can be obtained and used by the actor. This shows that an inseparable relationship exists between social networks and the development of social capital.

Network composition refers to the types of actors within a specific network, which may be identified by their characteristics, features, or resource endowments [34]. It can also be described by using the links between groups. Some earlier studies have analyzed firms' relationships with various organizations [35–37] while more recent studies have examined the similarities and differences between linked members [38,39,9]. Typically, the heterogeneity in network composition can be described as network diversity. The theoretical definition of such diversity is the degree to which the system is composed of uniquely different elements, the frequency distribution of these elements, and the degree of difference between them [40]. The diversity of social networks is the difference in capability, technology, resources, or knowledge between members of the networks. In this case, the higher the diversity, the more different types of technology, resources, and knowledge can be acquired, absorbed, and utilized by firms within the network [41,16]. There is an aspect of network diversity called "network technological diversity," which is the difference in regard to the types of technology that the members are attempting to develop [9]. When the technology is more diverse, the probability of a firm obtaining new knowledge increases. This shows that they are more likely to develop innovative solutions to problems and increase innovation output [42–44]. Therefore, since network technological diversity is a vital characteristic of social networks for high-tech firms, it is an important point of analysis for this study.

### 2.2. The relationship between network technological diversity and firm innovation

According to network theory, different firms have different resources and capabilities and thus establishing a linkage between previously unconnected firms can help in the integration of diversity or non-overlapping technological knowledge. In other words, firms with diverse ties can obtain diverse knowledge [39]. Therefore, the higher the network technological diversity, the greater the chance a firm has in obtaining abundant technological information and resources as well as receiving novel information that is vital for firm innovation [42,43]. In addition, this can also help to increase the diversity and number of interactions between knowledge and technology,

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