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Co-authorship networks and research impact: A social capital perspective

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ABSTRACT

The impact of research work is related to a scholar's reputation and future promotions. Greater research impact not only inspires scholars to continue their research, but also increases the possibility of a larger research budget from sponsors. Given the importance of research impact, this study proposes that utilizing social capital embedded in a social structure is an effective way to achieve more research impact. The contribution of this study is to define six indicators of social capital (degree centrality, closeness centrality, betweenness centrality, prolific co-author count, team exploration, and publishing tenure) and investigate how these indicators interact and affect citations for publications. A total of 137 Information Systems scholars from the Social Science Citation Index database were selected to test the hypothesized relationships. The results show that betweenness centrality plays the most important role in taking advantage of non-redundant resources in a co-authorship network, thereby significantly affecting citations for publications. In addition, we found that prolific co-author count, team exploration, and publishing tenure all have indirect effects on citation count. Specifically, co-authoring with prolific scholars helps researchers develop centralities and, in turn, generate higher numbers of citations. Researchers with longer publishing tenure tend to have higher degree centrality. When they collaborate more with different scholars, they achieve more closeness and betweenness centralities, but risk being distrusted by prolific scholars and losing chances to co-author with them. Finally, implications of findings and recommendations for future research are discussed.

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1. Introduction

For academic scholars, maintaining high levels of research productivity is essential to their careers. After a long and arduous research process, scholars commonly expect to publish their findings and have some degree of impact on the knowledge community. Greater research impact brings citations to and establishes the reputation of a scholar. That reputation not only provides a scholar with opportunities for sponsored programs (grants) but also inspires the scholar to continue his or her research efforts. However, each person has his or her own limited cognitive capabilities and bounded rationality (Simon, 1976). To cross the boundary, it is better for a scholar to conduct research in collaboration with other scholars. Such research collaboration allows scholars to work together and achieve a common goal by sharing research

workloads (Hauptman, 2005), specific expertise or particular skills (Soderbaum, 2001), and equipment or resources (Bammer, 2008).

Studies have shown that research collaboration can bring co-authors greater research productivity (Katz and Martin, 1997; Lee and Bozeman, 2005) and research impact (Gazni and Didegah, 2011; Sooryamoorthy, 2009). Whereas co-authorship is a form of collaboration in which collaborators publish their research outcomes through paper or electronic media, not all collaborators publish an article together (Katz and Martin, 1997). That is, co-authorship is an “explicit product” of scientific collaboration (He et al., 2011, 2012). Whenever a scholar publishes a co-authored article, he or she has created an individual co-authorship network. The co-authorship of an article reveals only those scholars who made direct contributions to the content of the article. It depicts the one-to-many relationships of a scholar with his or her co-authors. When individual co-authorship networks are threaded together based on the co-authors, they form a large network, which is the collective of the individual co-authorships (Ding, 2011; Liu et al., 2005; Lu and Feng, 2009; Otte and Rousseau, 2002). This network exhibits many-to-many relationships among scholars; with numbers of them being co-authors of co-authors who indirectly contributed their knowledge to published articles. Such an interconnected chain of relationships constitutes a social network in which valuable

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resources are shared in the forms of information, understanding, and knowledge through the conduct of social interactions. This network can provide members with collectively owned capital – known as social capital (Nahapiet and Ghoshal, 1998). This capital has been proven to positively influence knowledge creation (McFadyen and Cannella, 2004), knowledge transfer (Inkpen and Tsang, 2005; Walter et al., 2007), and knowledge contributions (Wasko and Faraj, 2005). Through social interactions, members in a collective can benefit from social capital and widen their horizons of understanding and, in turn, achieve better outcomes (Abbasi et al., 2011; Liao, 2011; Yan and Ding, 2009).

According Nahapiet and Ghoshal (1998), there are three dimensions of social capital: structural, relational, and cognitive, each of which will be discussed in detail in the next section. In this study, these three dimensions of social capital are referred to respectively as structural, relational, and cognitive capital. Past studies have applied social network analysis (SNA) to explain the dynamics of co-authorship networks (e.g., Acedo et al., 2006; Lu and Feng, 2009; Otte and Rousseau, 2002; Yan and Ding, 2009). However, they considered only the structural facet from social capital theory, overlooking the other two dimensions: relational and cognitive capitals (Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1998).

In reviewing the burgeoning literature on the topic, much evidence exists supporting the importance of social capital (e.g., Inkpen and Tsang, 2005; Wasko and Faraj, 2005). Despite the great interest exhibited by various researchers in the interrelationships among the three dimensions of social capital (e.g., Nahapiet and Ghoshal, 1998; Tsai and Ghoshal, 1998), prior studies have largely focused on the consequences of these dimensions independently without considering how they interact (Robert et al., 2008; Wasko and Faraj, 2005). Those studying the interrelationships generally treat structural capital as the predictor of relational and cognitive capitals (Liao and Welsch, 2005; Tsai and Ghoshal, 1998). Notwithstanding that the literature sheds light on the resources that can be derived from social-capital dimensions, it pays little attention to how people are proactive in changing and extending their social capital. Consider, in the context of a co-authorship network, that an author who does not occupy an advantageous position may try to increase his or her structural aspect of social capital by expanding his or her circle of social contacts. How, then, does an author change his or her social interactions and acquire a more desirable position within a larger co-authorship network? Clearly, the literature has hitherto devoted great attention to the consequences of structural capital but provides little insight into how this capital can be enhanced by relational and cognitive capitals. To fill the void in the literature, this study extends the understanding of prior studies from a more comprehensive perspective by applying social capital theory to co-authorship networks and examines the associations among a scholar's different dimensions of social capital and their effects on the research impact of the scholar. The objectives of this study are:

- Define the indicators of a scholar's social capital in a co-authorship network.
- Examine the effects of the indicators of social capital on the research impact of a scholar.
- Explore the impact of relational capital on structural capital.
- Investigate the effect of cognitive capital on structural capital.
- Assess the influence of cognitive capital on relational capital.

2. Background

2.1. Research collaboration, social capital, and research impact

Generally speaking, research impact is a recorded or otherwise auditable occasion of influence from research on actors in

academia, business, government, or civil society (LSE Public Policy Group, 2011). In academia, research impact is commonly regarded as the extent to which a scholar's work has been used by other researchers (Bornmann et al., 2008). A popular objective measure of research impact is the citation count provided by ISI's Web of Knowledge (Thomson Reuters, 2011). It has been validated and widely used in the natural and social sciences for evaluating the research contributions of articles, journals, institutions, and individuals (Brown and Gardner, 1985). Nevertheless, the citations in the Web of Knowledge include those from other authors and the authors themselves. The latter are self-citations that must be excluded when evaluating research impact. In essence, the citation count without self-citations can be used as a surrogate for research impact that indicates the extent to which a scholar's article influences other scholars (Liao, 2011).

Past studies have shown that research collaboration produces higher research impact than a single researcher in terms of number of publications (Katz and Martin, 1997; Lee and Bozeman, 2005) and citations (Gazni and Didegah, 2011; Sooryamoorthy, 2009). This is probably because a single researcher cannot effectively mobilize the resources necessary for conducting research (Kling and McKim, 2000). Through research collaboration, a scholar can share his or her resources, such as equipment, workload, expertise, and knowledge, with other scholars (Abramo et al., 2011; Katz and Hicks, 1997; Lee and Bozeman, 2005). Such resources, which are embedded in personal ties and useful for the development of individuals, are regarded as "social capital" (Tsai and Ghoshal, 1998). The social relationships, norms, and values attached to social capital determine the performance of individuals, groups, and organizations that are parts of a socially or economically connected network (Okoli and Oh, 2007). Such networks normally provide participants with opportunities for finding social support, exchanging social capital (including financial resources, goods, or services), and exploring and employing knowledge transfer (Lea et al., 2006). As a result, social capital has been broadly defined as the benefit that actors derive from their social relationships or network (Burt, 1992; Coleman, 1988).

Nahapiet and Ghoshal (1998) propose three dimensions of social capital that facilitate the development of intellectual capital: structural, relational, and cognitive. Each of these dimensions constitutes an aspect of the social structure and facilitates combining and exchange of knowledge among individuals within that structure (Wasko and Faraj, 2005). Several studies suggest that social capital theory provides valuable perspectives for understanding how participants leverage resources or knowledge by gaining value or advantages from social structure (Okoli and Oh, 2007; Tsai and Ghoshal, 1998; Walter et al., 2007). In the same vein, this study adopts the three dimensions of social capital to identify various ways by which a scholar obtains his or her resources or knowledge from social structure in a co-authorship network. These dimensions of social capital are discussed in the next three sections.

2.2. Structural capital of a co-authorship network

Structural capital refers to structural embeddedness (Granovetter, 1985), such as the network ties, configuration, and density of connections among individuals. It describes the "impersonal" configuration of linkages between and among people or units and indicates the overall pattern of connections between actors (Nahapiet and Ghoshal, 1998, p. 244), providing information about who you reach and how you reach them (Burt, 1992). In a social network, centrality is an important structural attribute that indicates an actor's formal power or prominence in the network relative to others (Burkhardt and Brass, 1990). If an actor is in a central position in the network, that actor has many connections

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