

The Influence of E-Business Alliance Network on E-Business Firm's Performance: An Exploratory Study

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ABSTRACT

In recent years the study of the influence of networks has extended beyond the discipline of sociology to the field of management and organization studies. Extant literature contains examples of various endeavors to study formal/informal networks at different levels of aggregation in an organization. With the rapid growth of the Internet there has been a greater need to demystify the dynamics of networks in the virtual world. As opposed to the studies which have focused on the networks among individuals on the Web, the present study explores the influence of e-business networks on e-business firms. This is accomplished by taking a sample of e-business firms from banking and recruitment industry in India. Comparison of this influence (of e-business networks on e-business firms) with the network influences of off-line businesses (on off-line businesses firms) highlights the points of similarity as well as dissimilarity that exist because of the different platforms. The result of the study also highlights the inter-industry differences and provides guidelines for the e-business practitioners for managing and optimizing their networks.

KEYWORDS

E-Business Strategy, E-Business Network, E-Business Firm' Performance, Social Network.

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1. INTRODUCTION

Collaborating with others to accomplish common objective(s) is an integral aspect of human endeavors. History is replete with instances of individuals, groups and societies coming together and joining hands to combat human or natural forces. Like other human activities, collaborations and alliances are also visible in business arena where the survival in a competitive market place is at stake. The primary objective of these alliances is to enhance the competitive abilities of a business entity by identifying the resource complementarities that lie with others and creating suitable and sustainable mechanisms for exchange (Porter, 1986).

The latter half of the twentieth century witnessed a surge amongst business firms to form various types of alliances (Ohmae, 1989). No longer were the alliances motivated by supply or distribution concerns. The alliances became more strategic¹ and context dependent. An increased competition for markets and resources due to reduced geographical barriers further fuelled this development. Such circumstances necessitated the growth of multi-faceted links between firms leading to inter-firm and inter-industry ties. The resulting picture is therefore a network of multifarious one-to-one, one-to-many and many-to-many inter-firm alliances.

This network, apart from providing access to resources, can also act as a constraining force on its actors. This may happen due to conflicting interests of different actors and actor groups in a network. Consequently, there have been increasing numbers of reports of failure of alliances (Parkhe 1993). This has resulted in a challenge for practicing managers and strategy experts to not only identify the possible causes of failure but also discover the key for a sustained and successful business association.

The increasing importance of the Internet as a business medium and the increased volume of e-business bring into prominence a type of firm which is unlike its brick and mortar counterparts. Given the difference between online and offline businesses, it is possible that the network influences manifest themselves in a different way for online firms (e-businesses). The present paper attempts to fill the gap that has existed in the form of the study of e-

¹ Parkhe (1993) defines strategic alliance as “Relatively enduring inter-firm co-operative arrangements, involving flows and linkages that use resources and/or governance structures from autonomous organizations, for the joint accomplishment of individual goals linked to the corporate mission of each sponsoring firm.”

business networks by studying a sample of e-business firms in India. This paper uses the hyperlinks between e-business Web sites to elicit the network data and a multiple regression analysis to study the influence of network of e-businesses on e-business firm's performance. The insights gained from the study could provide the information to guide the efficient selection and management of network partners.

The paper is arranged in the following manner. The introduction to the topic is followed by a brief discussion of the theoretical approach taken to study the networks. This is succeeded by the development of arguments for the formulation of hypotheses. The subsequent sections discuss the sample, data and methodology, followed by analysis and results. The paper concludes with the implications, limitations and scope for future research.

2. THEORY

Some of the established theoretical strands used to study the inter-organizational networks include game theory, resource-dependence theory, transaction-cost theory, institutional theory, etc. While early attempts to understand the dynamics of alliance networks have focused more on bi-partite alliances and have taken a qualitative perspective (Mizruchi & Galaskiewicz 1993, Webster & Morrison 2004), the more recent literature has emphasized quantitative approaches for studying inter-organizational networks. In the past few decades one influential theory has been Social Network Theory (SNT),² which has provided the tools and techniques to quantitatively analyze the influences of a network. Mizruchi & Galaskiewicz (1993) posit that the network theoretical approach incorporates tenets from different theories and therefore can facilitate the study of economic and political outcomes of network associations. Following recommendations in the literature (e.g. Mizruchi & Galaskiewicz 1993; Gulati 1998)

² Social Network Theory (SNT): Originating in sociology, where it is used to study networks of individuals in organizational and social worlds, SNT has been applied to the study of different kind of networks including inter-organizational networks. The theory defines a network as a structure consisting of nodes or actors (e.g. individuals, groups, organizations) which are connected through ties or relations. SNT applies the tools and techniques from graph theory (Moreno 1953, Erdos & R'enyi 1961, Harary 1969, Biggs, Lloyd & Wilson 1976) and statistics to study the real world networks in the areas like social sciences, physics, biology etc. Organization researchers and sociologists (Moreno 1953, 1960) have also successfully applied the concepts of SNT in the form of Social Network Analysis (SNA) on the networks of nodes at different levels of aggregation. Some of the prominent areas of study include the network effects on individual, group and organizational productivity and performance.

the present study uses a social network perspective to examine the influence of network on e-business firm's performance.

2.1 Relational Influence

The ties that bind the actors in a network are the focus of a large number of studies on inter-firm alliances. Since, the absence or presence of ties indicates the absence or presence of relationship between actors in the network, the study of ties is termed as the study of "relational" aspect of the network. One of the ways to measure this aspect of the ties is by identifying the strength of relationship (e.g. Granovetter 1973, Uzzi 1997, Suarez 2005). Based on the strength, the ties/alliances are classified as strong or weak. Strong ties, indicating close bonding with greater trust and co-operation, have been observed to have a positive influence on firm level indicants such as volume of business (Uzzi 1997); knowledge transfer and project completion time (Hansen 1999); degree of learning (Kale, Singh & Perlmutter 2000); innovation (Tiwana 2008); credit performance (Uzzi & Gillespie 2002); firm performance (Mitsubishi & Greve 2009) and choice of technology (Suarez 2005). Burt (1992) and Uzzi (1997) note that the strong ties may also have a negative influence on a firm. This negative influence of strong ties is attributed to reduced flexibility (especially in an uncertain environment) due to common norms and governance mechanisms established in a network characterized by strong associations.

Weak ties indicating lesser binding, lesser contact and co-operation have also been found to be beneficial to the actors in a network (Granovetter 1973, Hansen 1999). This benefit of weak ties is realized from the fact that weak ties bind actors which are farther from each other and increasingly dissimilar from each other. Consequently each actor by virtue of having access to different set of varied actors and networks can be a source of new ideas and information. Furthermore, weak ties require less commitment from the actors thereby also inducing greater flexibility to the actors.

Extant research also underscores the fact that the relevance of each type of tie could vary according to the industry to which a firm belongs (new or mature) or the evolution stage of a firm (March 1991). Strong ties from close partners (e.g. family & friends) may be required for acquiring necessary resources at the start-up phase while in early growth phase it develops

different associations driven by market needs (Hite & Hesterly 2001). These associations are weaker than the associations at the start-up phase. March (1991) argues that the importance of ties may vary according to environmental uncertainty. In an uncertain environment weak ties by being source of diverse information and increased flexibility can be more positively related to a firm's performance. On the other hand, in a certain and stable environment there is a greater emphasis on exploitation of existing resources than exploring new alternatives, an objective which is better accomplished through close and strong associations. Rowley et al. (2000) make the similar assertion for two different industries, the younger one (e.g. semiconductor) characterized by greater uncertainty than the more mature one (e.g. steel).

2.2 Structural Influence

With the advent of quantitative approaches like SNT, there has been a greater awareness about the significance of the structure of a network and a firm's position in that network (termed as structural characteristic). The structural characteristic of a network has been measured in different ways by the scholars. Some of the key structural characteristic of a network include structural hole, centrality and density. Access to a structural hole, interpreted as an opportunity for brokerage is considered as a key structural property of a network (Burt, 1992). According to Burt (1992) network constraint measures the lack of access to the structural hole and is measured as constraint score³. Centrality (Wasserman & Faust 1992), indicates an actor's reach (number of links/ties originating from the firm: out-degree centrality), prestige (number of links coming into a firm: in-degree centrality) and power (number of other firms which connect to one another through path, on which the focal firm falls: between-ness centrality). Density, another important network characteristic is defined as the proportion of possible ties that are actually present in a network i.e. it is the ratio of number of ties present to the maximum number of possible ties (Wasserman & Faust 1997).

Structural characteristics like structural holes, centrality, density are observed to have a positive influence on a firm. Burt (1992) stated that the actors who bridge structural holes

³ Constraint score, C_{ij} , given by $C_{ij} = (P_{ij} + \sum P_{iq} P_{jq})^2 : q \neq i, j$
where P_{ij} equals the strength of direct ties from i to j , and $\sum P_{iq} P_{jq}$ is the sum of the indirect tie strength from i to j via all q . Access to a structural hole is measured as $(1 - C_{ij})$.

derive benefits by virtue of brokerage they earn by playing a mediator role. It is observed that a business entity's access to structural holes positively influences its market share (Zaheer & Bell 2005), knowledge flow (Bell & Zaheer 2007), access to markets (Lee 2007) and its performance (Lin, Yang & Demirkan 2007). It is also observed that the intermediary role that results from access to structural holes also enhances the power of a firm.

Actors solicit associations with other actors that are reputed or perceived as important by other actors in a network. Consequently, for business networks, the firm which is perceived as such is sought by other firms in a network. As a result, such a firm is very likely to develop associations with many other firms in a network. Owing to multiple associations and a resulting central position this firm enjoys enhanced reputation and power, and becomes a hub for collection and dissemination of information, ideas and other resources. Studies shows that a central position in a network positively influences a firm's innovation output (Owen-Smith & Powell 2004; Kim & Park 2008), growth (Powell, Koput & Smith-Doerr 1996), power (Chen 2009) and performance (Lin, Yang & Demirkan 2007).

A dense (highly connected) network around a focal firm would have large number of firms having direct ties to a focal firm. A highly connected network would not only facilitate fast search and dissemination of knowledge & information, but would also help foster greater coordination and trust. As a result it is observed that the density of a network positively influences the likelihood of forming alliances (Garcia-Pont & Nohria 2002), profitability and ROA (Rowley, Behrens & Krackhardt 2000) of a firm.

Researchers have also recorded the negative influence of structural/positional characteristics (structural holes, density) on a firm's innovation output (Ahuja 2000, Stuart 2000) and the likelihood of alliance formation (Garcia-Pont & Nohria 2002), thereby indicating that, like relational influence, the structural influence of a network is also contextual. While positive effects of structural characteristics are due to the fact that a better position in a network bestows greater opportunity and power to a firm, the negative effects are a result of opportunism and mistrust that result in an unproductive collaboration (Ahuja 2000).

2.3 e-Business Network

A few scholars (Park, Barnett & Nam 2002, Merwe, Pitt & Berthon 2004) have focused on

the inter-business associations on the Internet. In one of the earlier studies, Jackson (1997) has applied the SNA tools on hyperlink network of Web sites to conclude that hyperlink networks influence social choices and communication structure on the Web. Merwe et al. (2004) and Park (2003) note that hyperlinks between Web sites can be used to study networks among individuals, organizations and countries. While, Park et al. (2002) have called for a new approach (Hyperlink Network Analysis) to study the relations on the Web using hyperlinks, Merwe et al. (2004) have used the tools and techniques of Social Network Analysis and demonstrated a methodology for identification of key actors and opportunities in a network.

Apart from the selected studies that apply tools of network analysis to the development and growth patterns of linkages on the Web, the study of network effects on an e-business firm, in the light of the greater volume of business being conducted online, is largely an unexplored area. Differences and similarities in the business strategies and practices between online and offline businesses (Hanson 2000, Porter 2001, Noughton 2006) indicate that the network effect may or may not be similar on both platforms. The present work explores this gap by formulating and testing a set of hypotheses related to the influence of an e-business network on an e-business firm's performance.

The subsequent section introduces key characteristics of e-business networks along with some definitions which will help in measurement and quantification of e-business network characteristics.

3. RESEARCH MODEL AND HYPOTHESES

3.1 e-Business Network

A Web site is the most important interface for any organization that conducts business through the Internet. The information available on the Web site may include details of the products, services, purchase and delivery mechanisms, the financials, information on various alliances and partners etc. All this information is presented on multiple Web pages which are connected to one another through links. These links, which are termed as hyperlinks are the preferred way to navigate from one Web-page to another (Park 2003). Hyperlinks can be

used for navigation within a Web site (from one Web-page to the other) and navigation between Web sites (e.g. navigation to a partner Web site). Associations between various e-businesses can therefore be identified from the hyperlinks that connect one Web site to the other (Park 2003). These associations between e-businesses can be termed as “formal” if they are documented and recognized by all the parties involved and as “informal”, otherwise (Merwe et al. 2004).

In the absence of any documentary evidence, it might be difficult to classify alliances identified from hyperlinks as formal associations between firms. But by being the vehicle of mobility and carrier of information, these links, irrespective of being formal or informal, play a significant role in e-commerce and e-business activities (Krebs 2000, Palmer et al. 2000, Barnett et al. 2001, Merwe et al. 2004).

Based on their characteristics one can distinguish between the types of links that connect different Web sites. Survey of the popular literature and a discussion with a panel of industry experts (8 practitioners each having more than 10 years of experience in the Internet and technology businesses) revealed that in the context of inter-firm (between e-businesses) associations, the hyperlinks (Merwe et al. 2004, Tremayne 2004), that represent the ties between e-businesses can be classified into the following types:

1. Unidirectional
 - Outgoing Hyperlink
 - Incoming Hyperlink
2. Bi-directional

A bi-directional tie is a combination of uni-directional hyperlink to and from (outgoing as well as incoming) another Web site.

For the purpose of this research, a uni-directional tie is referred as a “weak tie” and a bi-directional tie is referred as a “strong tie.” The basis of this nomenclature was the presence/absence of reciprocity, which can be used to distinguish between a strong and a weak tie (Granovetter 1973, Wellman & Wortley 1990, Walker et al. 1994, Rowley et al. 2000, Gilsing & Nooteboom 2005). Further, it can be argued that though uni-directional links on the Web do not require any formal strategic agreement between the Web sites, any formal

agreement is extremely likely to appear as a bi-directional link between the two e-business Web sites.

This study refers outgoing tie as a negative tie because according to conventional understanding amongst the e-business firms (as pointed by the experts) an outgoing tie/link provides outward mobility, thereby taking a visitor away from the focal site. Following the same logic, an incoming link, which acts as a carrier of incoming traffic (Palmer et al. 2000) is referred to as a positive tie.

3.2 Hypotheses

A firm's performance is positively influenced by the strong as well as the weak links (Granovetter 1982, Burt 1992, Haythornthwaite 1999) because of the resources obtained from the partners through these ties. It is observed that strong ties enhance a firm's performance by being a medium through which complex; specialized and proprietary information transfer takes place (Uzzi 1996, 1997, Hansen 1999). It has also been observed that weak ties can also be beneficial to actors in a network by being a source of novel information (Granovetter 1973, Rowley et al. 2002). Further, the novelty and variety of information and other human/material resources accessed through network is a function of the diversity of network partners. The absence of such diversity will result in redundant information and other resources obtained through the network (Baum, Calabrese & Silverman 2000, Kim & Park 2010). It is found that the diversity of the association positively affect a firm's performance (Powell et al. 1996, Dyer & Nobeoka 2000, Koka & Prescott 2008), innovation (Tiwana 2008, Kim & Park 2010) and access to emerging markets (Lee 2007). This leads to the formulation of following hypotheses for the network of e-businesses:

H1a: The number of strong ties (bi-directional links) *positively* influences an e-business firm's performance.

H1b: The diversity of strong ties (bi-directional links) *positively* influences an e-business firm's performance.

H2a: The number of weak "positive" ties (uni-directional incoming links) *positively* influences an e-business firm's performance.

H2b: The diversity of weak “positive” ties (uni-directional incoming links) *positively* influences an e-business firm’s performance.

The associations in a network may also be disadvantageous to the focal actor if they consume the vital resources and hinder the flexibility and consequently the performance. Labianca, Brass & Gray (1998) and Labianca & Brass (2006) call these ties as negative ties and have found, for a network of individuals, that these ties/associations are related to reduced cohesiveness and perceptions of conflict among the members in a group. Further, it has also been found that existence of such ties negatively affects the performance of a firm (Baldwin, Bedell and Johnson 1997, Sparrowe, Liden, Wayne & Kraimer 2001). In the context of e-businesses, the links that are uni-directional and outgoing serve the purpose of taking the visitor from one destination/Web site to another destination/Web site. Therefore unless the firm is in the business of providing information (e.g. directory services, news) such links will take the visitor away from the focal web-site. Hence, given the technology and consequent ease of navigation, such outgoing links may actually harm the business of a firm. This leads to the following hypotheses:

H3a: The number of negative ties (uni-directional outgoing links) *negatively* influences an e-business firm’s performance.

H3b: The diversity of negative ties (uni-directional outgoing links) *negatively* influences an e-business firm’s performance.

The structural influence of a network can be studied using different measures of a firm’s position in a network. The gains ensued are similar for each of these measures and therefore inclusion of multiple measures would result in redundancy. Consequently, following Powell, Koput & Smith-Doerr (1996) and Tsai (2001), the present study uses network centrality as a measure of structural effect of network. The central position results in a greater access to resources and bestows greater power to a firm in a network (Powell et al. 1996, Tsai 2001, Owen-Smith and Powell 2004). Therefore between-ness centrality (Owen-Smith & Powell 2004), which indicates a firm’s position in the network and measures the structural effect of

network will positively influence an e-business firm's performance. Accordingly the following hypothesis is proposed:

H4: The centrality (between-ness) of a firm in a network *positively* influences an e-business firm's performance.

Businesses on the Internet are technology intensive and therefore lay great emphasis on integrating latest technology into the offerings and their delivery mechanism. Despite the commonalities conferred by technology and platform, businesses on the Web can be differentiated on the basis of industry and market uniqueness. For example, a substantial difference exists between the online retail banking business, which follows the offline roots (brick and mortar business) and online recruitment business which, to a large extent, has replaced the offline recruitment practice. Rowley et al. (2000) have found that the choice of the industry influences the relationship between network variables and firm performances. It can thus be suggested that the industry peculiarities will also moderate the level and extent of influence exerted by network variables on the performance of online businesses. To test this effect the industries which reflect the characteristics of businesses on the Web and are comparable should be selected. The firms belonging to these industries are the ones which generate value through their online activities. These firms can be classified into the following categories (Grover and Saeed 2004):

1. Pure e-businesses or businesses that only use online platform (e.g. horizontal portals like Yahoo, Rediff; vertical portals e.g. online matrimony services like www.jeevan.sathi.com, www.bharatmatrimony.com)
2. Businesses that have traditionally been offline but now have extended their services on the online platform (e.g. Retail Banking: Citibank, ICICI Bank etc, Recruitment portals: Monster, Naukri).
3. Businesses that have their origin in Web platform but are also complementing it by offline presence (e.g. Matrimony service like Shaadi).

It is important, in the context of the objectives of this study, to distinguish between

businesses which are established on the online platform and those that have yet to establish themselves in the new medium. It follows that the firms that have considerable experience and are established on the online platform are in a better position to exploit the resources and opportunities available on the Internet. Consequently, pure e-businesses or businesses that are predominantly e-businesses are likely to demonstrate a greater competency on the Internet and also a greater sensitivity to the influences of e-business networks.

The present study, takes the example of recruitment and banking industries to highlight the differences that exist in the businesses which operate in both on-line and off-line environments. Before the proliferation of Internet, recruitment was an off-line business (service) activity. Owing to tremendous ease of use coupled with greater access to the Internet over the years, on-line recruitment has taken over its off-line counterpart. On the other hand, banking has been slow to adapt to the new platform due to greater risks and security related issues. Moreover, good existing infrastructure in the form of number of branches and ATMs has ensured that banking business continues to thrive on the off-line medium. Given these contrasting characteristics, the recruitment portals and the online banking, which are also the one of the earliest businesses to exploit the advantages of Internet in India, are selected as the two businesses for testing the influence of industry⁴. Thus incorporating the difference between the online recruitment and the online banking businesses, following hypotheses are proposed:

H5a: The number of strong ties (bi-directional) in online recruitment businesses will have higher *positive* influence on firm performance as compared to those in online retail banking businesses.

H5b: The number of weak “positive” ties (incoming uni-directional) in online recruitment businesses will have higher *positive* influence on firm performance as compared to those in online retail banking businesses.

⁴ Banking and recruitment are the businesses that were the earliest to start their operations on the Internet platform in India. In the year 1997 ICICI bank was the first bank to start e-banking and in the same year naukri.com became the first e-recruitment portal in India. Banking and recruitment are also amongst the most widely used services in India (IAMAI Report, 2006). These were the other reasons that these two businesses were selected for the study.

- H5c: The number of negative ties (out-going uni-directional) in online recruitment businesses will have higher *negative* influence on firm performance as compared to those in online retail banking businesses.**
- H5d: The diversity of strong ties (bi-directional) in online recruitment businesses will have higher *positive* influence on firm performance as compared to those in online retail banking businesses.**
- H5e: The diversity of weak “positive” ties (incoming uni-directional) in online recruitment businesses will have higher *positive* influence on firm performance as compared to those in online retail banking businesses.**
- H5f: The diversity of negative ties (out-going uni-directional) in online recruitment businesses will have higher *negative* influence on firm performance as compared to those in online retail banking businesses.**
- H5g: The firm centrality in strong ties (bi-directional) network of online recruitment businesses will have higher *positive* influence on firm performance as compared to those in online retail banking businesses.**

4. SAMPLE AND DATA

4.1 Sample

There are different criteria to identify the scope for the study. These criteria are related to characteristics of actors in a network (e.g. firms belonging to the same industry) and/or characteristics of relationships between actors (e.g. strategic alliances). Following Doreian & Woodard (1994) and Rowley et al. (2000), both criteria were used for the purpose of selecting firms. These criteria were also deemed relevant because one of the objectives of the study was to check for existence of industry effects. Furthermore, instead of including all the players, the expert opinion was used as a suitable method to identify the representative firms for each industry.

A list of active Indian e-recruitment portals was prepared on the basis of their popularity and visibility amongst Indian e-businesses. Online directories and ranking Web sites (e.g. Yahoo & Alexa) were also referred for the purpose. A final list of 8 portals was arrived at

after considering experts' views on the most representative e-businesses in the e-recruitment portal domain. These 8 businesses represent the total population of e-recruitment portals that are widely regarded as having a pan-national presence.

There are a large number of banking institutions which operate at national and regional levels in India. Most of these banks provide e-banking services (basic banking, account information, money transfer, cheque book ordering, de-mat account etc.) to their customers. The top 30 Indian banks (Adhikari 2007) with balance sheet sizes of more than Rs. 20,000 crores were selected for the study. These are all large banks with a nationwide presence.

4.2 Data

Unlike the USA and some of the other countries, there is a lack of documented evidence in India (available in the public domain) about the tie-ups and alliances of firms. This is especially true for the private limited and/or partnership firms in India, whose information is seldom documented in publications. The present study identifies an alternative way to collect such information for e-business firms. This method is adapted after discussions with experts and on the basis of recommendations in literature (Park 2003, Merwe et al. 2004, Pitt et al. 2005).

4.2.1 Network Data

The network data was collected during February and March, 2007. Two kinds of Web site analysis software⁵ were used to collect data on the number of incoming and outgoing links on the e-business Web sites considered for the study.

A separate list of outgoing and incoming links to a particular e-business Web site was made for all the e-business firms in the study. Both types of links were then matched for each firm to identify the bi-directional (strong) ties. This was followed by a count of incoming and

⁵ The software "Web Link Validator" (licensed version) was used to identify the total number of links on a Web site including the list of outgoing links. The software scans all the pages on a Web site and gives the output of all the links present. This exercise, for each Web site, may take from a few hours to a few days for completion. The time taken is a function of the size i.e. number of pages and links and the speed of Internet connection. The software "Weblink SEO" (trial version) was used to identify the total number of incoming links on a Web site. The software uses the database of existing search engines for this purpose.

outgoing links, after separating the strong ties from the lists, to identify the number of uni-directional ties. A count of strong ties was also made. The data was then checked for duplication and a manual check of each link was made to ensure that it was an active link to another active Web site. Thereafter, the diversity of ties was calculated for each type of tie (unidirectional i.e. outgoing/negative, incoming/positive and bidirectional/strong). NAICS (North American Industry Classification System) codes were used for the purpose of classifying each Web site in a specific industry type. A diversity index for a firm was calculated on the basis of Blau's (1977) index of heterogeneity. For a firm i which has j types of partners the diversity of its network is given by $d_i = 1 - \sum_j p_{ij}^2$, Where, i : index of firms, j : index of the type of partners of a firm i , j varying from 1 to J , n_i : total number of partners of all types for firm i , n_{ij} = total number of partners of type j for the firm i (i.e. belonging to industry j), p_{ij} is defined as the ratio n_{ij} / n_i , the proportion of firm i 's partners of type j , Using the set of bi-directional ties a firm by firm symmetrical matrix of dyadic ties was created for each of the two categories of e-businesses (Indian recruitment portals, Indian e-banking) in the sample. Positional/Structural variable for each firm was calculated, from this matrix using the Social Network Analysis software, UCINET (Borgatti, Everett & Freeman 2002). Between-ness Centrality (Freeman 1977, Tsai & Ghoshal 1998) was measured as the proportion of times an actor (firm) falls in the paths between two other actors (firms). Wasserman and Faust (1997) suggested a standardized between-ness index (S.B.I) for a firm i and defined it as:

$$S.B.I = 2 [\sum_{jk} (g_{jk}(i) / g_{jk})] / (g-1)(g-2); I \diamond j \diamond k, j < k$$

Where,

$g_{jk}(i)$ = number of geodesics⁶ linking the two actors (firms) j and k that include the firm i

g_{jk} = number of geodesics linking the two actors (firms) j and k

g = total number of actors in the network.

⁶ Geodesic distance (Wasserman and Faust, 1997) is the count of the number of intermediate relations/links in the shortest possible path from one actor to another. Geodesics are the number of such paths.

4.2.2 Non-Network Data

The non-network data for the study is related to the performance and the size of the firms for each of the businesses. Profitability was used as the measure of performance and the amount of total assets was taken as the measure of size, the control variable. For Indian banks the information on profitability (PAT) and assets was taken from the annual reports of each bank for the financial year ending March 2007. Since majority of the recruitment portals are private limited firms or partnership firms, the financial data for these firms are not available in public domain. Consequently, following the literature (e.g. Zaheer & Bell 2005) experts' rating were used to measure the performance of these firms. Highlighting the advantage, Zaheer & Bell (2005) argue that the expert's rating method as opposed to published sources (e.g. company reports) is a more current assessment of a firm's characteristic. The experts (industry professionals, each having more than a decade's experience in recruitment industry in India) from the industry were asked to rate the performance of the recruitment firms on a Likert scale of 1 to 7 (where 1 denotes very bad performance and 7 denotes very good performance).

The database of candidates that the recruitment firms build⁷ over a period of time is their most important asset. It is this asset i.e. the database which attracts an employer to a recruitment firm. Consequently, similar to the amount of total assets for banking firms, the "database quality" was identified as the control variable for e-recruitment portals. Again, owing to the lack of any information in public domain, the expert rating method was followed to assess this variable. Responses from six experts were obtained for assessing the performance and those from nine experts were obtained for assessing the database quality. Their average ratings were used for analysis.

5. METHODOLOGY AND DATA ANALYSIS

The relationship between independent network variables and the e-business firms' perfor-

⁷ According to the experts, since recruitment portals are pure e-business, this asset (their database) is predominantly developed through the network i.e. when visitors from other Web sites visit (& register themselves) the focal Web site by navigating through hyperlinks. This is unlike the recruiters who already have a database (developed off-line) that might, later on, be integrated with their on-line initiative.

mance for both networks was analyzed using multiple regression models. Firm performance was taken as the dependent variable in the regression equation. The independent variables in the model represented the relational and the structural effects of the network. The relational effect was measured from the number and diversity of the strong, weak and negative ties, while the structural effect was measured from the centrality of the firm in the strong ties network.

Firm size represented by total assets of the firm was taken as the control variable. For recruitment portals this asset was defined, based on expert's suggestion, as the quality of database. The assets of a firm are developed due to the internal capabilities of the firm and/or they are the resources acquired from the external agencies in the firm's network. Therefore network effects have to be partialled from the total assets before the total assets can be used in the model to explain the performance. This was done by regressing the control variable on those network variables that best explained its variance. The residual of this regression represents the control variable from which network effects are removed.

The number of independent variables in the regression model for Indian banks was large (8) as compared to the sample size (31). Therefore a variable selection criterion for identifying the best model (like step-wise regression) was needed. Leach (2007) suggests that the step-wise procedure inflates the type I error and it may not be able to select the best set of predictors. Consequently all possible subsets for all the independent variables were analyzed using variable selection criteria of maximum R-square in SAS 9.2. Using this criterion, out of a total of 8 variables 3 variables were finally selected for the model. This also meant that the sample size of 31 was now adequate for regression analysis. The best model (significant at 1%, adjusted R-square = 0.973) thus obtained using SAS 9.2 is explained in the Table 1 below.

5.1 Indian Banks

The results of the regression analysis for the sample of 31 Indian banks are given in Table 1 below. The R-square for the regression is 0.9757 (adjusted R-square = 0.973) which is marginally significant at the 10% level. The variables which are significant (at 10%) in the model are total asset, number of strong ties and the diversity of strong ties.

Table 1. Regression Output: Indian Banks (Using SAS 9.2)

Model Fit			
		Sig (P-Value)	
R-square	0.9757		
Adjusted R-square	0.973		
F Value	360.09	0.001	
Independent Variables	Parameter Estimates	P-Value (one-tail)	P-value (two-tail)
Intercept	-45.15868	0.13315	0.2663
Asset	0.00822	0.00005	0.0001
N-Strong	125.03117	0.0012	0.0024
Div-Strong	-530.81997	0.00545	0.0109

The observed significant relationship between the number of strong ties and performance leads to acceptance of hypothesis H1a. The results of regression show that the diversity of strong ties significantly influences performance but contrary to expectations, the influence is negatively associated with performance. A possible explanation for this result could be attributed to banking business which owing to its very nature, even in an online environment, is a serious activity for users. This raises the possibility that online banking is a dedicated and attentive effort and the focus of users during that duration is predominantly on banking & finance issues. Such a mind-set and surfing environment that is conducive to banking, finance and investment related activities may not be in sync with other (less serious) online behavior. As a result a user is less likely to notice and utilize the links to other diverse (non-finance related) businesses. Association with different business firms, in principle, is beneficial to an organization because of the resources they provide but developing and maintaining strong ties to diverse set of partners could involve investment of dedicated resources and specialized skills (because of peculiarities associated with different partners belonging to different businesses). Such associations/ties may not contribute favorably to a firm's performance especially when the returns on technical and financial resources invested in establishing and maintaining these ties are meager.

5.2 Indian Recruitment Portals

Similar to the analysis for the Indian banks, to identify the best model, all possible subsets for all the independent variables were analyzed using variable selection criteria of maximum R-square using SAS 9.2.

Owing to a small sample size, for studying the relationship between the dependent and independent variables for the network of Indian recruitment portals, the permuted regression (or randomization) tests that involve resampling using random permutations, were used (Yucesan 1994, Kennedy 1995, Anderson & Legendre 1999, Anderson 2001, Cade 2005). These tests use distributions generated by resampling and hence they can be used for non-random and small samples (Noreen 1989, Dallal 2007). Social Network Analysis software, UCINET version 6.126 (Borgatti, Everett & Freeman 2002) was used to perform these tests. This software calculates the coefficients of the estimates using OLS (ordinary least squares) method and simulates random permutations (5000) for calculating the standard error. These standard errors are used to test the significance of regression coefficients. The best model (significant at 1%, adjusted R-square = 0.693) thus obtained is explained in the Table 2 below.

TABLE 2. Regression Output (Randomization Test): Indian Recruitment Portals (Using UCINET 6.126)

Model Fit			
		Sig (P-Value)	
R-square	0.795		
Adjusted R-square	0.693		
F Value	9.709	0.005	
Independent Variables	Parameter Estimates	P-Value (one-tail)	P-value (two-tail)
Intercept	3.084732	00.025	0.5
Between-ness Centrality	4.093201	0.032	0.064
Div-Strong	0.340159	0.02525	0.0505

The results of the regression show that between-ness centrality (H4) and diversity of strong ties (H1b) are the significant (at 10%) variables. The significant influence of these variables on performance provides acceptance for hypotheses H4 and H1b. While positive relational

effects of the network are observed for one variable (i.e. diversity of strong ties), the results also indicate the positive influence of structural effects of network on a firm's performance. These results indicate that the recruitment portals are examples of an industry which is moving towards stability and hence weak ties have less relevance in the network (Rowley et al. 2000).

6. DISCUSSION

6.1 Network Effects

The first research question is related to the effect of the network of ties among e-businesses on an e-business firm's performance. Out of the six hypotheses related to the network effects the results show support for hypotheses H1a (positive influence of the number of strong ties; Indian banks) and H1b (positive influence of the diversity of strong ties; Indian recruitment portals). This result is in accordance to what has been observed for offline businesses (Hansen 1999, Powell et al. 1996, Uzzi 1996) thereby indicating similar influence of strong ties for businesses on both platforms. The results show no support for the hypotheses H2a and H2b which are related to the positive influence of weak positive ties i.e. incoming links. The influence of weak negative ties i.e. outgoing links is also not significant and therefore indicates no support for the hypotheses H3a and H3b. These results are in contrast to the "strength of weak ties" theory of Granovetter (1973) and the observations made by Hansen (1999) for brick and mortar businesses (Hansen (1999) found both positive as well as negative influences of weak ties on the search and transfer of knowledge between business units).

This unexpected result highlights the fact that all kinds of links and associations may be strategic and ad-hoc selection and random associations even in the Internet world may prove counterproductive. For example, the large numbers of incoming links may result in a greater traffic but this may cause congestion and result in slower access for legitimate users. If majority of the visitors representing this traffic are non-prospects then very few business opportunities will be generated.

The results for the influence of weak ties obtained in this study this may not be a general

phenomenon for e-businesses and might be unique to the e-businesses considered in this study. Both e-banking and e-recruitment businesses are amongst the oldest e-businesses in India, having started in mid 1990s. Consequently, firms which are into these businesses have a fair amount of experience and expertise in terms of technology and platform. The resulting reduced uncertainty may have contributed to undermined significance of weak ties which have a greater role to play in an uncertain environment.

The results also indicated partial support for the hypothesis H4 (positive influence of structural effect i.e. between-ness centrality; Indian Recruitment Portals). This result are in accordance with the observations made by Owen-Smith and Powell (2004) and Tsai (2001) who observed a positive influence of centrality on innovation output for offline businesses. This outcome is though, not in agreement with the observations made by Rowley et al. (2000), who didn't find any network structural influence for brick and mortar businesses.

The aforesaid draws attention to the contextual nature of the network effects and also underscores the similarities and/or differences with the brick and mortar businesses.

6.2 Industry Effect

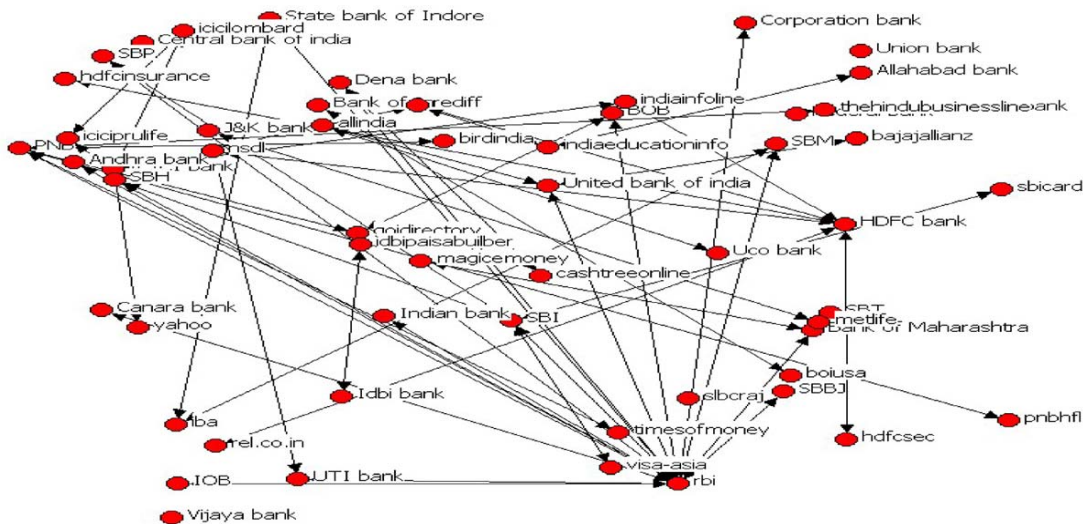


Figure 1. Online Network of Indian Banks⁸

⁸ Each spot/dot in the figure, along with the name, depicts a firm in the network and each line denotes its link to some other firm in the network. A firm-by-firm matrix of bi-directional ties is used to prepare this diagram using social network analysis software UCINET.

It was argued that the network influence on e-business firms may vary from one industry to the other. Accordingly seven hypotheses (H5a to H5g) were formulated to study the change in network influence according to the industry characteristics. Two e-business networks viz. Indian recruitment portals and Indian banks were compared (see Figure 1 and Figure 2 below) to test this conjecture. The results demonstrate the points of similarity as well as difference between the two networks.

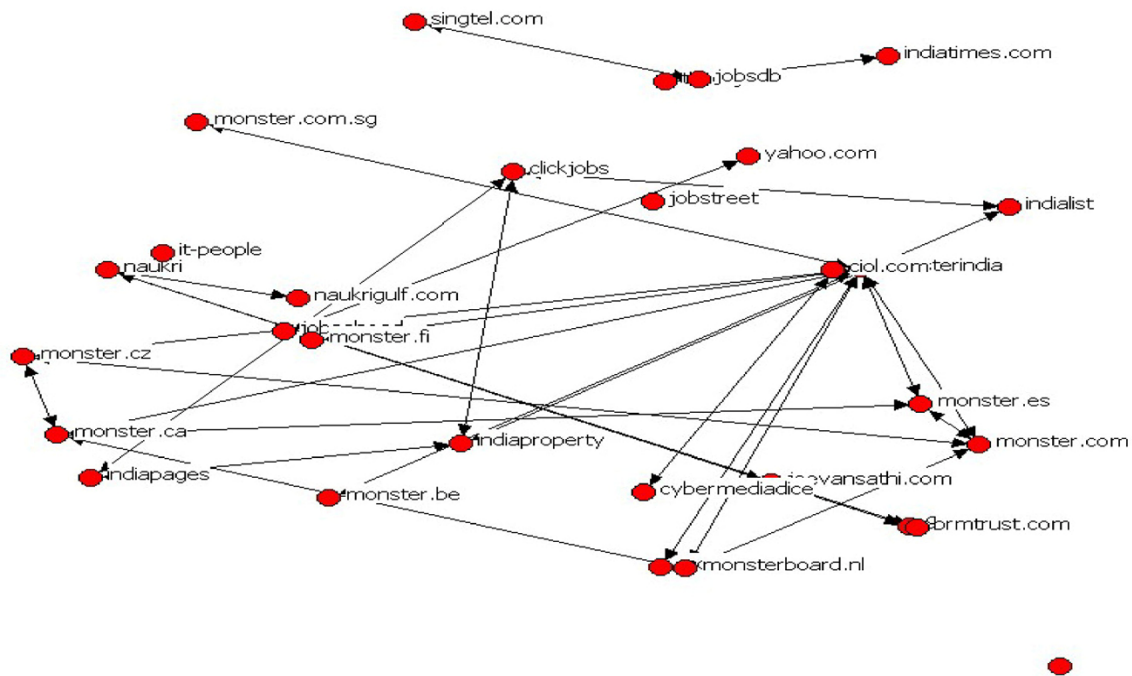


Figure 2. Network of Indian Recruitment Portals

Indian bank's online initiatives have followed their off-line roots and are relatively new on the Internet platform (exploration phase). In comparison recruitment portals are purely online businesses which rely heavily on harnessing technology and the use of innovative methods to exploit the opportunities in the new platform (exploitation phase).

In accordance with the hypotheses (H5g and H5d respectively), between-ness centrality and the diversity of strong ties are found to be having a more positive influence for Indian recruitment portals. The result indicates that the network effect is different for these two industries. The structural effect of the network (measured by between-ness centrality) is

found to be significant for Indian recruitment portals while, in contrast, the effect of relational component (reflected by the number of strong ties) is having a greater influence on Indian banks. This observation is in conjunction with the premise of Rowley et al. (2000), who hypothesized greater structural influence for firms in a mature industry.

The number of strong ties is found to have a significant influence on the performance of Indian banks but contrary to expectation it did not contribute significantly to the performance of Indian recruitment portals. This result doesn't provide support to hypothesis H5a and is incongruous to the observations made by Rowley et al. (2000), who found a greater positive influence of strong ties for mature brick and mortar businesses.

Also, interesting to note is the contrasting influence of diversity of strong ties (negative for Indian banks and positive for Indian recruitment portals), which as explained earlier, further highlights the industry differences and provide support for hypothesis H5d.

Finally, there is no significant difference between the industries with regards to the influence of weak ties (both incoming and outgoing ties). Thus there is no support for hypotheses H5b, H5c, H5e and H5f.

Although, it was not hypothesized, the observed significance of the size of the firm's total assets on the performance of Indian banks and its non-significance for the performance of Indian recruitment portals may also be an indication of the presence of industry effects.

7. IMPLICATIONS

The present study shows that for the new as well as the mature e-businesses, the strong ties rather than the weak ties influence performance. The influence of weak ties may not be significant for e-businesses that have considerable experience with the platform and the technology. This happens to be the case even when the businesses are at different level of maturity in terms of their online activity. Therefore, such businesses would do well to invest their resources in developing strong associations.

Since relational effects are more influential for younger (less mature) e-businesses, relatively less mature e-businesses (like Indian Banking) may benefit by focusing more on the relational component to enhance their legitimacy and to generating more business

opportunities. On the other hand, the structural effects of a network (between-ness centrality) have a positive effect on performance for mature e-businesses, whose networks are characterized by a greater number of ties and links. Therefore e-businesses in a less mature industry should initially focus on exploiting the relational influence and over a period of time (as they evolve and mature) increase their focus on getting the positional advantage in the network (March 1991).

It can be inferred from the negative influence of the diversity of strong ties of Indian banks that such online Indian banks may do well to link themselves with similar entities even if the aim is gaining greater visibility and legitimacy. Greater visibility and reputation amongst similar businesses may result in enhanced perceptions of security & trust (Park et al. 2002) which are proven determinants of success on the Internet platform.

The results also show that greater network centrality and density can be counter-productive for firms in a volatile (young) industry or for firms in exploration stage. This underscores the need for conscious efforts by e-business firms to manage their networks depending upon the industry and the stage of evolution.

Finally, the non-significant influence of incoming links to performance for Indian banks reveals that the large number of incoming links, unlike the common perception, may not necessarily be beneficial for all type of e-businesses. This brings to the fore a downside associated with the internet platform which is due to the nature of technology and its prevalent use. Therefore, there always exists a high possibility of unsolicited associations as there are no means to control/check the creation of a link from one web-page/web-site to another web-page/web-site. Such associations on the Web can result in negative publicity for the target web-site if there is something wrong with the source web-site. Also, such associations, established through hyperlinks, can be demanding on resources (unsolicited traffic may require various measures for filtering or restricted access because this traffic may hamper the legitimate user by drawing on the crucial financial/technical reserves).

Owing to the characteristics of the platform this problem can't be handled by individual Web sites/e-businesses. The situation entitles framing of cyber laws which mandates permission from the target Web site before creation of link. While, government and non-government institutions are engaged in a debate over the issue of freedom and control on the internet, the

aforementioned possibility (that can lead to “Denial of Service” attacks) calls for framing of laws & regulations that are necessities of future.

8. LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

The present exposition is an exploratory study which is cross-sectional in nature. Therefore the results are indicative and it will require further research across samples and time before more concrete conclusions are drawn. Research initiatives across spatial and temporal settings with larger sample size may provide greater support for the results of the present study. Studying e-businesses from other countries (e.g. USA, UK) where the number of firms is large may provide further insights and may throw more light on the network dynamics.

The present study focuses exclusively on e-businesses belonging to two industries and therefore the results may not hold true for all the industries. Research initiatives that take into consideration other e-businesses also are required to generalize the observed influence of network. Future research could also look into industry differences for two purely online businesses (e.g. online matrimony and portals) and study how pure e-businesses from different industries match-up. Taking a cue from extant literature (Powell et al. 1999) future studies could also take a look into evolution of e-business firm's networks. Such an initiative would provide greater insight into the rules of association on the Internet. This will also help to establish whether these rules are similar or different from those of brick and mortar businesses.

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