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A Preliminary Investigation of the Moderating Affects of National Culture and Regulation on the Relationship between Innovation and Performance of Information Service Firms

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ABSTRACT

Using Institutional theory, we show that the relationship between an information service firm’s innovation activities and firm performance is moderated by cultural and regulatory distances. Because this involves two different units of analysis, a hierarchical regression scheme was used employing 22 nations and 442 firms. We found that the relationship between R&D and sales is stronger for firms located in nations with less regulatory and cultural distance from our benchmark nation, the U.S.

KEYWORDS

Institutional Theory, Multilevel Analysis, Firm innovation and performance, Cultural and Regulatory impacts.

INTRODUCTION

Service sectors, unlike manufacturing, have not generally been considered technologically advanced, with innovation previously playing only a small role in explaining the aggregate performance of an organization (Cainelli et al., 2006). More recently, the service industry has been under pressure to apply Information and Communication Technology (ICT) in innovative ways to improve performance. As a result, the traditional view of services being relatively non-adopters of technology has changed (Andersen et al., 2000; Metcalfe and Miles, 2000; Gadrey and Gallouj, 2002; Tether, 2003).

However, there are notable differences in service performances across nations. For example, according to the World Bank, national value added services in constant 2000 US$ for 2005 (the latest year for which data is available), varies from $1.23 trillion for Germany, $758 billion for China, $582 million for Laos, and $63 million for Guinea-Bissau.

This paper focuses on an important subset of services industry: the information services industry which includes publishing (software, traditional and the Internet), motion picture and sound recording, broadcasting, telecommunications, Internet service providers and web search portals, data processing, and information services industries (U.S. Census Bureau, 2008). Within this industry, we examine the role of environmental factors on firm’s innovation and performance. Innovation is viewed as a mechanism by which organizations can exploit their core competencies to improve performance outcomes critical for success (Reed and DeFillippi, 1991).

Innovation is also by environmental, organizational, and individual factors (Wolfe 1994). Environmental factors may include national culture and regulatory factors. It is known that cultural differences act as a barrier to the transfer of technological know-how and innovation activities (Davidson and McFetidge, 1985; Shane, 1995), and has an impact on the cost of technology diffusion between firms or branches in multi-national corporations (MNC) (Klein and Ralls, 1995; Antia et al., 2005). Another important factor in firm performance is the national regulatory policies, including institutional environments resulting from the legal, political and economic systems of a nation (Kostova, 1997). Beck et al. (2005) found that firms operating in underdeveloped systems (i.e., in countries that have constraining financial, legal, and corruption obstacles) are affected to a greater extent than firms operating in countries with better developed systems. It is imperative, therefore, to also investigate the impact of national socio-cultural and regulatory factors on the relationship between a firm’s innovative efforts and performance in the service sector.
The present paper investigates these impacts on information service-related firms. In the next section we discuss the role of institutional theory in explaining the influence of national cultural and institutional environments on the relationship between firm innovation and performance.

**BACKGROUND**

**Institutional Theory**

Institutional theory, adopting an open system perspective, considers the manner in which organizations influence their environment and actively contribute to the social construction of these environments (DiMaggio and Powell, 1991; DiMaggio, 1998). Not only are competitive forces and efficiency-based forces involved, but socially constructed belief systems and rules also have a substantial impact on firm behaviors (Scott, 2001). Over time the feedback between internal and external environments generates homogeneity among organizations in a shared environment, or organizational isomorphism. As a result, organizations lose some of their distinctive behaviors and structures and begin resembling each other (Stout and Cornode, 1998).

Institutional theory identifies three types of pressure faced by firms coming from three fundamental elements (pillars) of institutional theory: regulatory, cognitive and normative (Scott, 1995). Ramsey summarizes these pressures nicely (Ramsey, 2005). The regulatory element “reflects the existing laws and rules in a particular national environment that promote certain types of behaviors and restrict others” (Kostova, 1999, p. 314). The cognitive element shows “the widely shared social knowledge and cognitive categories (e.g., stereotypes) that influence the way a particular phenomenon is categorized and interpreted” (Kostova and Roth, 2002, p. 217). The normative element reflects the values, beliefs, norms, and assumptions about human nature and behavior held by the individuals in a given country.

**National Culture**

The assumption that national culture influences organizational behavior is generally well accepted (Oliveira, 2004; Adler, 1996; Robbins, 2006). National culture shapes and reflects societal and individual value systems, which are manifested in societies’ institutions, including their corporations (Culpepper and Goosby Smith, 2007) and plays a role in technology transfer (Kedia and Bhagat, 1998; Umanath and Campbell, 1994; Phillips et al., 1994; Jensen and Scheraga, 1998). Both cognitive and normative components of institutional theory have been shown to concern national cultural factors (Lawler, 2006; Rangan and Sengul, 2005).

According to Hofstede (2001), culture is equivalent to the collective mental programming of a group, tribe, minority, or a nation. It is the aggregate of individual personality traits. Based on the data obtained, he classified countries along four dimensions (described below). He then rated the countries along these dimensions. He found, for example, that the US is high in individualism, low in power distance, high in uncertainty avoidance, high in masculinity. The following are brief descriptions of Hofstede’s cultural dimensions:

1. **Power Distance (PD).** This measure refers to the extent to which a society accepts the unequal power distribution within or between institutions and firms. A high-power distance society means that people in that culture more readily accept wider differences in power compared to low power difference cultures.

2. **Uncertainty Avoidance (UA).** This attribute describes the extent to which individuals feel threatened by uncertain and ambiguous situations, and try to avoid them. In a culture with high uncertainty avoidance, mechanisms are created to reinforce and reduce risks.

3. **Individualism and Collectivism (IC).** Individualism refers to a loosely coupled social network where people take care of themselves. In contrast, collectivism refers to a tightly coupled social network where the group feeling is very strong.

4. **Masculinity and Femininity (MF).** To the extent that a culture is feminine, the values of human relationships and concern for others are high. On the other hand, masculine cultures are more assertive and value materialism.

**Regulatory Practices**

A nation’s regulatory environment stems from political influence and the desire for legitimacy. Firms must adhere to that nation’s laws, regulations, policies, and procedures. Additionally, firms must recognize national economic freedom factors, such as corruption in the judiciary, customs services, government bureaucracy, non-tariff barriers to trade, as well as others. These practices flow from the regulatory component of institutional theory.
Institutional factors affect a firm’s transaction and production costs of production and innovation (Verwaal and Donkers, 2003). Kostova (1997) notes that national environments consist not only of culture but economic and political systems that also play a role in organizational behavior. Regulatory factors should, ideally, represent the rules and regulations and the extent to which these are enforced (Scott, 2001: Ionascu et al., 2004).

THE RESEARCH MODEL AND HYPOTHESES

The research conducted involved two different units of analysis (described in detail in the methodology section): The firm level (level 1) and the national level (level 2). On the firm level, we are concerned with the affect of a firm’s innovation on performance. On a national level, we examine how culture and institutional practices mediate the relationship between innovation and performance. The research model is given in figure 1.

The impact of Innovation on Firm Performance.

A number of studies have supported the relationship between innovation and firm performance/productivity. Cainelli et al. (2004) found that innovation has a positive impact on both growth and productivity and, further, that the higher the level of innovation expenditure in ICTs, the better the economic performance of firms.

Cultural Distance and Regulatory Distance.

In order to empirically examine the role of cultural and regulatory differences of nations on a nation’s firm’s performance, the concepts of cultural and regulatory distances may be used (Licht and Moch, 1999). According to Ionascu et al. (2004), “The concept of ‘distance’ has been of central interest to international business scholars’ attempts to explain variations in international business strategies and operations across countries.” The greater the distance between a host and client nation, the greater the difference in cultural, regulatory and cognitive differences.

Xu and Shenkar (2002), Beugelsdijk et al., (2007) have observed that it is not the absolute level of quality of host nation’s institutional/cultural value systems that determines trade flows but the differences in institutional/cultural quality levels between nations. A similar argument can be put forward to explain the differences of firm’s performances in information service sector in different nations. Thus the role of cultural distance and regulatory distance warrants additional investigation.

Conceptually, the cultural distance between nations represents “the sum of factors creating, on the one hand, a need for knowledge, and on the other hand, barriers to knowledge flow and hence also for other flows between the home and the target countries” (Barkema, 1997). Cultural distance has been used in studies involving MNC strategies and organizational characteristics (Kogut and Singh, 1988; Barkema and Vermeulen, 1998; Chang and Rosenzweig, 2001), technology transfer (Gomez-Mejia and Palich, 1997).

Similarly, regulatory distance has been used in past research, although primarily in the international business arena (Beugelsdijk et al., 2004, Ionascu et al., 2004).
Our first hypothesis is:

H1: The relationship between R&D and sales will be stronger for firms located in nations with less cultural distance from the U.S. (i.e., whose cultural values are more similar to those of the U.S) than for firms located in nations with more cultural distance from the U.S (i.e., whose cultural values are less similar to those of the U.S).

Our second hypothesis is:

H3: The relationship between R&D and sales will be stronger for firms located in nations with less regulatory distance from the U.S. (i.e., whose regulations are more similar to those of the U.S) than for firms located in nations with more regulatory distance from the U.S (i.e., whose regulations are less similar to those of the U.S).

METHODOLOGY AND DATA

The present research problem requires examining country-level effects in addition to firm-level factors that can have an impact on the dependent variable. This approach necessitates the use of multi-level modeling instead of traditional statistical techniques which could be inadequate and produce erroneous results (Parboteeah et al., 2005, Bryk and Raudenbush, 1989). Guided by our research objectives we therefore developed a multi-level hierarchical linear model (HLM) where in level 1, the firm-level data were employed and in level 2, where national-level cultural data were used. The HLM model used in the final stage was Intercepts and Slopes as Outcomes Model (Bryk and Raudenbush, 1989). We thus indulge in a 2-level analysis, firm and national.

The level 1 (firm-level) analysis estimates parameters describing the intra-group relationship(s) between dependent (LSALES) and an independent variable (LR&D Investment). In level-2 (national-level) analysis, the parameters depicting intercept and slope in level 1 analysis become the dependent variables for the level -2 analysis that also examines the role of cultural distance based on four national Hofstede’s cultural dimensions (PD, UA, IC and MF) variables as well as the role of regulatory distance based on economic freedom index of Heritage House (Heritage, 2005). A cross-level relationship is established when significant coefficients on predictors of intercepts and slopes emerge at this stage.

Five test models were applied:

Model 1: Analysis of variance (ANOVA)
Model 2: A random coefficient model that examines the impact of innovation on firm performance (level 1)
Model 3: A multi-level model examining the affect of cultural distance (CD) on the firm level relationship
Model 4: A multi-level model examining the affect of regulatory distance (RD) on the firm level relationship
Model 5: A multi-level model examining the affect of CD and RD on the firm level relationship

Information Service Firms

To test our hypotheses developed above, we selected a sample of firms at the firm level of analysis. The sample of firms is taken from Standard and Poor’s Compustat industrial files. These data constitute an unbalanced panel that covers 1972 to 2006. in the area of information (NAICS code = 51). We selected the year 2004 because it returns better data sets and research shows that data from 2000 and later tends to be stable. The information sector contains data from 23 nations with a total of 491 firms, and contains many segments such as: a) traditional publishing like newspaper, periodical, book, mailing list etc b) software publishing c) motion picture and video-related services, d) Radio/TV services e) Internet/web related services, f) telecommunication and data processing services. This sector is also representative of service sector as it contains both old and new services and information firms are an important sector of service firms. After eliminating missing and ambiguous data, the final number of firms got reduced to 445. US firms (47% of the total) consist of a large majority of the selected firms, followed by Japan, UK, Canada, Germany and France. Most of these firms are from Software Publishers (64%), followed by Telecom (14%) and Internet/Web service (14%) segments.

Innovation.

Because innovation (the independent variable) is not directly measurable, we selected the surrogate measure of R&D investment, primarily because it has often been used for this purpose in research.

Firm Performance.

Firm performance (the dependent variable) has several definitions, and is acknowledged as a composite construct, but is most often expressed in terms of sales or income or profitability. Ettlinger and Tufford (1996) defined firm performance by changes in total sales, or by value added per employee. In this study, we use the surrogate metric of net sales for performance.
Cultural Measures: The Cultural Dimension Index and Cultural Distance

Since the U.S is the leader in information service related activities, it is assumed that nations which are culturally close to the U.S will exhibit similar firm performance while nations which are culturally distant will exhibit lower performance. In this article we apply Hofstede’s cultural dimensions as measures of national culture and cultural distance (CD) as a measure of the overall distance of a nation from the U.S using the four (PD, UA, IC and MF) Hofstede cultural dimensions (Kogut and Singh, 1988). CD is derived as:

$$CD_j = \frac{1}{4} \sum_{i=1}^{4} \left( \frac{(I_{ij} - I_{IN})^2}{V_i} \right)$$

Where: $CD_j$ is the cultural distance between country $j$ and the US, $I_{ij}$ is country $j$'s score on the $i$th cultural dimension, $I_{IN}$ is the score of the US on this dimension, and $V_i$ is the variance of the score of the dimension.

Project Globe (House et al., 2004) has extended Hofstede’s dimensions by adding three additional dimensions: Humanistic, Performance, and Future Orientation. Their nine dimensions reflect not only the dimensions of Hofstede’s theory but also McClelland’s theories of national economic development (McClelland, 1961) and human motivation (McClelland, 1985). However, since this is preliminary investigation, and given the enormous number of studies which have used Hostede’s dimensions, for the sake of simplicity and confirmatory evidence, we also relied on Hofstede’s dimensions.

Regulatory Measures: The Heritage Index and Regulatory Distance

The Index of Economic Freedom from the Heritage Foundation includes a broad array of institutional factors determining economic freedom (Heritage, 2005). To name a few: corruption in the judiciary, customs service, and government bureaucracy, non-tariff barriers to trade, such as import bans and quotas as well as strict labeling and licensing requirements, the fiscal burden of government which encompasses income tax rates, corporate tax rates, and trends in government expenditures as a percent of output; the rule of law, efficiency within the judiciary, and the ability to enforce contracts, regulatory burdens on business, including health, safety, and environmental regulation; informal market activities, including corruption, smuggling, piracy of intellectual property rights, and the underground provision of labor and other services. A high value of the Heritage index denotes a low institutional development in a nation. For example, Argentina, Belgium and the U.S have scores of 3.04, 2.1 and 1.86 in the year 2003, respectively.

Regulatory distance (RD) is measured as the distance (using the same calculation method as used for cultural distance) of a nation from the U.S in terms of Heritage index. Data from the year 2003 was selected for the study.

RESULTS

Table 1 shows the preliminary HLM analysis of the multi-level data. The unstandardized values for each coefficient are given along with the standard deviations (in parenthesis). Prior to hypotheses testing, several pre-tests were conducted. First, the existence of variance (both within-firm and between-nations) needed to be examined. Model 1 (ANOVA) shows that the portion of total variance that remains unexplained is statistically significant ($\chi^2=372.03$, $p<.000$). 47.6% of the variance in firm performance is explained by the between nations analysis. Model 2 is a random coefficient model that examines the impact of the level 1 independent variable (innovation) on firm performance. Once again, it indicates that the portion of total variance that remains unexplained is statistically significant ($\chi^2=741.46$, $p<.000$), and needs to be explored using national-level variables.

We next examined, separately, whether level 2 variables (CD and RD) can elucidate the unexplained variances of firm performance using an Intercepts and Slopes as Outcomes Model (Models 3-4, based on hypotheses 1-2). There is a negative and significant interaction of CD on the relationship between LSALES and LR&D Investment (coefficient value= -.287, $t=-2.3$, $p=.03$) thus supporting $H_1$. There is also a negative and significant interaction of RD on the relationship between LSALES and LR&D Investment (coefficient value= -.254, $t=-2.68$, $p=.02$) providing support for $H_2$. We also note that the innovation variable (LR&D) is significant and positive in all models where it was introduced. When both CD and RD are entered in the regression at the same time, the interactions of CD and RD with LR&D Investment still emerge as significant, although weakened (Model 5).
<table>
<thead>
<tr>
<th>Model No./Description</th>
<th>1: ANOVA</th>
<th>2: R&amp;D Invest</th>
<th>3: CD</th>
<th>4: RD</th>
<th>5: CD and RD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firm Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>6.191***(.44)</td>
<td>6.309*** (.46)</td>
<td>6.351*** (.47)</td>
<td>6.368** (.42)</td>
<td>6.376*** (.45)</td>
</tr>
<tr>
<td>LR&amp;D Investment</td>
<td>0.733*** (.09)</td>
<td>0.779*** (.13)</td>
<td>0.572*** (.14)</td>
<td>0.792*** (.09)</td>
<td></td>
</tr>
<tr>
<td><strong>Country Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD</td>
<td>0.512 (.40)</td>
<td></td>
<td>0.160 (.39)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RD</td>
<td>0.479** (.14)</td>
<td></td>
<td>0.445** (.13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cross-level Interaction (Slope)</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>CD*LR&amp;D Investment</td>
<td>-0.287** (.13)</td>
<td></td>
<td>-0.204* (0.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RD*LR&amp;D Investment</td>
<td>-0.254** (.10)</td>
<td></td>
<td>-0.173* (0.10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1 variance¹</td>
<td>3.472</td>
<td>4.304</td>
<td>1.837</td>
<td>1.836</td>
<td>1.82</td>
</tr>
<tr>
<td>Level 2 variance</td>
<td>0.069</td>
<td>0.185</td>
<td>0.101</td>
<td>0.19</td>
<td></td>
</tr>
</tbody>
</table>

¹ There were 442 Level 1 Units, and 22 Level 2 units
***: p < 0.001, **: p < 0.05, *: p < 0.10

Table 1. Results of HLM: Firm Sales (in natural logarithm: LSALES)

CONCLUSIONS AND DISCUSSION

The present study has some limitations. First, Hofstede’s cultural data, although often validated, are old and, due to globalization, managers from one nation increasingly hold a position of authority in another nation, thus affecting homogeneity (Baskerville, 2003; Gallivan and Srite, 2005). However, scholars have argued that culture changes very slowly. Second, care must be taken when generalizing the result to other service sectors due to the limited number of nations (due to data availability) used in the study. Third, the measure of innovation (the amount of money spent on R&D) may not adequately capture the process innovation that occurs in many firms. More studies are needed to investigate these aspects.

Despite these drawbacks, this preliminary study, relying on institutional theory as a framework, shows that the influence of innovation activities on an information service firm’s performance is moderated by cultural and regulatory factors. The article has implications for information service firm performance. Cultural and regulatory distances of nations from the US moderate the relationship of innovation and performance of IS firms. Strategically, to improve performance of IS firms, a nation could try to reduce cultural and regulatory distances from the US. The empirical support is based on multi-level hierarchical regressions using a large number of firms and nations. It also provides a framework for investigating the impact of national factors on a variety of firm-level behaviors including performance.

Future work may extend the analysis to include more service industries, compare the results of the service industry with the manufacturing industry and may include a time series analysis. The study could also be extended determine what national level characteristics are most conducive, or obstructive, to firm performance.

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