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# The Influence of Environmental Structures on International Digital Integration: A Theory of Embeddedness

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## ABSTRACT

The goal of this dissertation is to propose a theory of embeddedness and test it in the context of inter-organizational relationships. The theory argues that the structure of organizational relationships is determined by the setting in which they exist, and that this setting may be defined in terms of four inter-related dimensions: cognitive, cultural, structural and political. The study will investigate international inter-organizational relationships. This particular context adds to the complexity of the study by creating two environments in which the organizations are embedded.

## Keywords

Digital integration, environmental embeddedness, institutional economics.

## INTRODUCTION

Business-to-business (B2B) digital integration has been studied in developed countries from different perspectives, including but not limited to economics –with preeminence of transaction cost economics (TCE)–, operations management –with a focus on supply chain management (SCM)–, industrial marketing –with focus on relational marketing–, information systems –with focus on inter-organizational systems (IOS) and linkages–, social-economics –with a focus on network processes and in diverse fields looking at cultural consequences in the adoption of innovations.

The proposed study integrates these perspectives into a comprehensive framework that addresses the antecedents and outcomes of digital integration in inter-national environments. The study addresses these effects at the macro level, which comprises national and bi-national factors.

The research questions that motivate the study are:

- RQ1: What configuration aspects of the environment in which two organizations are embedded affect their willingness to integrate their functions digitally?
- RQ2: To what extent does digital integration increase inter-organizational relationship performance?

## BACKGROUND AND THEORETICAL DEVELOPMENT

### The Concept of Embeddedness in Economic Anthropology

Originally introduced by Polanyi (Polanyi, 1957), the concept of embeddedness argues that the economy is immersed in –and subject to– a society. Contrary to [then] contemporary conventional economic wisdom, Polanyi argued that the society determines economic behavior and that material gain is not the only incentive to participate in economic activity (Dalton, 1965 3, Wilk, 1996). Dalton posits that “the institutions [organizations] through which goods were produced and distributed in repetitive, structured fashion, were ‘embedded’ in –a subordinate part of– social institutions” and that those social institutions control economic activity (Dalton, 1965). He further states that economic exchanges and allocation of rights to natural resources are structured in response to the need for communities to assure the provision of items necessary for community life (Dalton, 1965). More contemporary studies address embeddedness as a complement to economic rationalities and posit that individual motivations are not the only stimulus for economic activity.

The proposed study investigates the influence of the environment in the decision to integrate digitally with providers and suppliers, and the impact of such integration in the relationship performance.

An embeddedness framework introduced by Zukin and DiMaggio (1990) is used to describe the environment. The framework argues that organizational relationships and behaviors are determined by the setting in which they exist, and that the architecture of this setting may be broken down into four inter-related dimensions: cognitive, cultural, structural and political (Zukin and DiMaggio, 1990). Figure 1 depicts the relationship between the organization and the environment. The organizational relationships and behaviors studied relate to interorganizational integration through information technologies. The perceived benefits derived from these activities are also investigated.

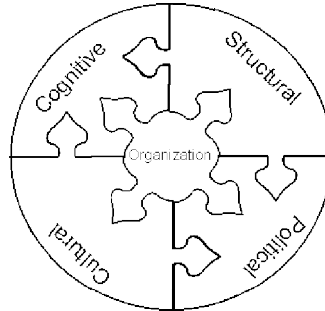


Figure 1. The concept of embeddedness

**Inter-organizational Functional/Operational Integration**

The central construct in the model is *interorganizational digital integration*. The term will be used interchangeably with digital functional integration and operational integration throughout this paper.

Three theoretical bases are regularly applied to the study of inter-organizational relationships: transaction cost economics (TCE), the relational view, and the information processing view of the firm. TCE argues that firms adopt arrangements that range from markets to hierarchies –including hybrid forms in between– as a compromise between the lower transaction costs derived from markets and the lower coordination costs derived from hierarchies (Williamson, 1979, Williamson, 1981). Relational theory elaborates on TCE by contextualizing the structural costs within interorganizational relationships and focusing on the sources for gains that may be accrued from the relationship (Dyer and Singh, 1998). The information processing view of the firm, on the other hand, posits that firm –and inter-firm– structures emerge in response to the information processing needs of the organization(s) (Galbraith, 1977). The following section elaborates on these three perspectives.

*Functional Integration: A TCE Perspective*

TCE has been mainly utilized to explain the governance structures between organizations. These governance structures are usually defined as a continuum of relationalism, which ranges between market and hierarchies (Williamson, 1979, Williamson, 1981). While the market end is usually referred to as ‘market’, the hierarchy end receives different denominations including: hierarchy (Williamson, 1979, Williamson, 1981), organizations, relational exchange (Dwyer et al., 1987)

According to TCE, the main dimension that determines the position in the continuum is *asset specificity*. Williamson, in particular, suggests six types of asset specificity: (1) site specificity, (2) physical asset specificity, (3) human asset specificity, (4) brand names, (5) dedicated assets, and (6) temporal specificity (Williamson, 1979, Williamson, 1981).

*Digital Vertical Integration: A Relational Theory Perspective*

Following the tradition of TCE, the relational view of the firm defines a partnership in terms of its distance to a market-type relationship (Dyer and Singh, 1998). Four types of attributes of the relationship determine such distance –and, therefore, its relationalism–: (1) relation-specific assets, (2) knowledge sharing routines, (3) complementary resources and capabilities, and (4) governance mechanisms (Dyer and Singh, 1998). They propose that there are gains to be obtained from each of these attributes.

*Interorganizational Communications: Information Processing View*

Galbraith posits that greater task uncertainty requires greater amounts of information to be processed (Galbraith, 1977). As such, firms create mechanisms –many times in the forms of hierarchies– to increase coordination. He posits that firms utilize

four different mechanisms to deal with uncertainties: (1) creation of slack resources, (2) creation of self-contained tasks, (3) investment in vertical integration systems, and (4) creation of lateral relationships.

### *Operationalization*

All these views concur on the view of integration efforts as an investment in relation-specific assets and processes and that this investment positions the relationship in a market-hierarchy continuum. In their study of interorganizational relationships, Robicheaux and Coleman (1994) define operational integration as a continuum from discrete to integrated, which parallels the market-hierarchy continuum found in TCE (Williamson, 1985). They propose that channel integration is the combination of four factors: (1) Joint Actions, (2) Assistances, (3) Information Exchange, and (4) Monitoring (Robicheaux and Coleman, 1994). Digital integration is therefore defined as the investment in digital technologies related to these four processes.

### **Relationship Performance**

In order to provide a greater contribution, the study also investigates the impact of digital integration in relationship performance. Research posits that performance of interorganizational relationships are assessed by the partners in terms of efficiency and equity (Ring and Ven, 1994). Efficiency refers to the extent to which the adoption of IOS leads to reduced transaction costs, faster delivery times and fewer errors. Equity refers to the extent to which the rewards attained are fairly distributed among the partners. Recent studies combined efficiency and equity in a degree-symmetric (D-S) measure that accounts for both effects (Klein et al., 2003, Straub et al., 2004). The effect of digital integration on performance is represented in the following hypothesis:

*H1: Higher levels of digital integration are associated to higher levels of relationship performance.*

### **Embeddedness**

As previously stated, the proposed study uses the idea of embeddedness (Zukin and DiMaggio, 1990) to explain organizational behavior relative to the use of information technologies in B2B relationships. Zukin and DiMaggio posit that organizations are embedded in structures that influence their actions (1990). They posit that there are four types of embeddedness factors: cognitive, cultural, structural and political.

#### *Cognitive Embeddedness:*

*“The ways in which the structured regularities of mental processes limit [or enable] the exercise of economic reasoning” (Zukin and DiMaggio, 1990 p.15)*

Extant research on organizational and interorganizational structures and governance mechanisms identify uncertainty as a driving force for hierarchical control (Gulati and Singh, 1998). Galbraith and Williamson identify uncertainty and complexity as important factors in the development of interorganizational structures. Galbraith posits that organizations adopt vertical integration systems to compensate for uncertainty (Galbraith, 1977), while Williamson posits that bounded rationality is an important factor in the adoption of structures (Williamson, 1975, Williamson, 1979, Williamson, 1981).

In this work uncertainty is broadly defined as an inability to predict future outcomes. This definition follows the tradition of the information processing view of the firm. Various researchers have posited that demand uncertainty, in its many forms, has a fundamental and enduring impact on firm operations (Luo, 2004, Shenkar and Von Glinow, 1994). The following hypothesis result:

*H2a: Higher levels of demand uncertainty (risk) are related to higher degrees of digital integration.*

Complexity, on the other hand, entails the lack of understanding or infrastructures required by the technologies used in digital integration. E-readiness has been widely recognized as an enabler of adoption of said information technologies. Country eReadiness captures concept of environmental eRadiness and is defined as the “degree of preparation of a nation or community to participate in and benefit from ICT developments” (Dutta and Jain, 2003 10). The following hypothesis result:

*H2b: Higher levels of country e-readiness are related to higher degrees of digital integration.*

While instinctively it appears that higher country uncertainty (i.e., risk) is associated to lower levels of development –and therefore lower digital integration–, it is proposed that uncertainty inherently leads to a need for integration, while the lack of development is accounted for in the e-readiness component of the cognitive construct.

**Cultural Embeddedness:**

*“Culture, in the form of beliefs and ideologies, taken for granted assumptions, or formal rule systems, also prescribes strategies of self-interested action and defines the actors who may legitimately engage in them”* (Zukin and DiMaggio, 1990 15)

Extant research suggest that information technology transfer is subject to cultural influences (La Ferle et al., 2002, Hermeking, 2005, Hill et al., 1998, Straub et al., 2003, Straub et al., 2001). Hofstede’s four-dimensions cultural framework (Hofstede, 1980) has been widely applied to the study of diffusion of technological innovations across countries (nations). Most studies focused on uncertainty avoidance (UA), one of four dimensions, which showed to be negatively correlated with innovativeness in general (Steenkamp et al., 1999) and with the adoption of the Internet (Mooij, 1998, Mooij, 2000, Mooij, 2004) or of ICT products (Yeniyurt and Townsend, 2003) in particular. This effect was moderated –i.e., weakened– by literacy and international trade. LaFerle et al (2002) extended the analysis to all four dimensions and found that three of the four original dimensions were significantly correlated to Internet adoption, while the masculine/feminine dimension presented inconclusive results (table 1). In accordance with LaFerle et al’s findings, I posit hypotheses for the significant dimensions only:

<b>Dimension</b>	<b>R</b>
Individualism/Collectivism	.63 †
Power Distance	-.61 †
Uncertainty Avoidance	-.40 *
Masculinity	-.28 n/s

Sign indicates direction, † p<.001, \* p<.01, n/s not significant (p<.1)

**Correlation results between Hofstede’s Cultural dimensions and Internet Adoption (La Ferle et al., 2002)**

- H3a: Higher levels of national individualism are related to higher degrees of digital integration.*
- H3b: Higher levels of national power distance are related to lower degrees of digital integration.*
- H3c: Higher levels of national uncertainty avoidance are related to lower degrees of digital integration.*

In addition to considering the individual characteristics of each culture, there is a second approach that focuses on the differential characteristics of the cultures. This second approach posits that cultural differences affect the communication processes, hampering collaboration efforts. Cultural distance is represented by a composite index that is calculated as follows (Kogut and Singh, 1988):

$$CD_{ij} = \frac{1}{4} \sum_{i=1}^4 \frac{[(I_{ix} - I_{iy})^2 / V_i]}{4}$$

Where  $I_{ix}$  is the cultural score for the  $i^{th}$  dimension of country x,  $I_{iy}$  is the cultural score for the  $i^{th}$  dimension of country y and  $V_i$  is the variance for the  $i^{th}$  dimension.

The following hypothesis results:

- H3d: Higher levels of inter-national cultural distance are related to lower degrees of digital integration.*

**Structural Embeddedness:**

*“The contextualization of economic exchange in patterns of ongoing interpersonal relations”* (Zukin and DiMaggio, 1990 p.15)

The present study follows Gnyawali and Madhavan's conceptualization of structural embeddedness, which they define as "how the interfirm network influences competitive behavior" (Gnyawali and Madhavan, 2001 432). Relationships are conduits for three types of resources owned by the network: assets, information and status. Organizations, therefore, adapt their patterns of relationships to improve the flow of resources within the network. Two characteristics of the network that affect these adaptations –i.e., digital integration– are centrality in the network and density of the network as a whole (Gnyawali and Madhavan, 2001).

Centrality refers to the role of the organization as a hub within a supplier or production network. The theory suggests that organizations in more central positions would tend to engage heavier in integration activities. Density refers to the average degree of connections of the members of the network; it measures the overall level of interconnectedness. The theory suggests that organizations in dense networks would tend to imitate this behavior and also engage heavier in integration activities.

The following hypotheses emerge:

Three hypotheses emerge:

*H4b: Higher levels of centrality are related to higher degrees of digital integration.*

*H4c: Higher levels of density are related to higher degrees of digital integration.*

Industry density is also an important network measure. Since industries span across boundaries and are not constrained to countries, industry density is considered a control variable rather than a core variable to the model.

*Political Embeddedness:*

*"The sources and means of economic action that reflect inequalities of power" (Zukin and DiMaggio, 1990 p. 15)*

Research shows that organizational action is influenced by external organizations proportional to the degree of dependence on those (DiMaggio and Powell, 1983). This influence has a number of different sources and/or causes, including "resource-dominant organizations, regulatory bodies, and parent organizations" (Teo et al., 2003 23). Chwelos et al (2001) propose that dependency on as well as enacted power of the trading partner are major predictors of intent to adopt electronic data interchange (EDI). In this sense, the dependency on the partner is represented by the availability of alternate suppliers in the case of buyer-side or by the percentage of sales that a certain customer represents in the case of supplier-side. The enacted power, on the other hand, will be a direct result of the partner's degree of informatization, or e-readiness. The two factors are merged in a combined construct which we will call politico-commercial stress.

The following hypothesis emerges:

*H5a: Higher levels of politico-commercial stress are related to higher degrees of digital integration.*

## **RESEARCH DESIGN**

The proposed research involves the use of secondary and primary data gathering techniques, and recognized structural equation modeling techniques for the data analysis.

### **Unit of Analysis**

The unit of analysis of the study is the relationship, while the proposed study is a one sided-study. In other words, the study only investigates one side of the relationship.

### **Instrumentation**

In order to prevent method bias and due to the nature of the constructs, the quantitative study involves the following data collection methods and sources: (1) a web-based survey will query on the level of digital integration; (2) a second web-based survey will query on the relationship performance to a different informant in the same organization; and (3) secondary data from international trade organizations will be gathered to assess the independent variables. Pilot interviews will be conducted to evaluate and refine the measures and phone interviews would be utilized to address non-respondents of the web-survey.

The web instrument will be developed in the following stages: (1) a review of the theory, summarized in the current document, informs the major constructs and measures, (2) preliminary interviews with executives both in the U.S. and abroad will be conducted to adapt the measures to an international context, and (3) a pilot instrument will be developed, tested and adapted if necessary.

The final instrument should allow for the test of structural models, in accordance to accepted guidelines. The pilot study would also inform on the sample requirements of the study, as the *effect size* is a necessary variable to determine sample requirements.

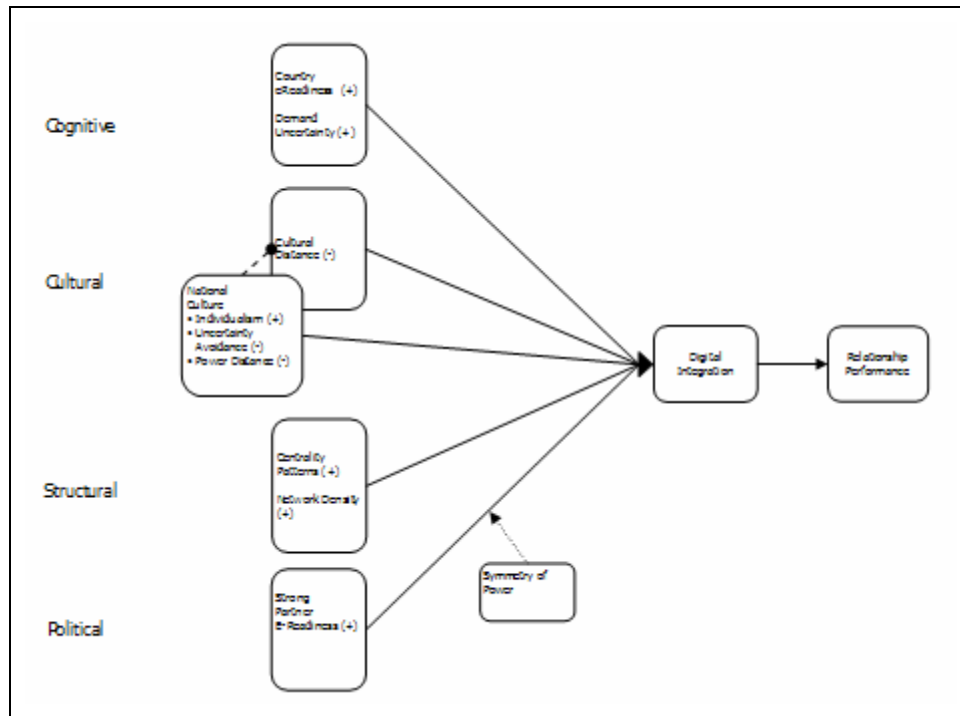


Figure 2. Research Model

**National measures**

The required data for countries is readily available. Applicable sources vary according to the construct. For example, research and websites dedicated to individual cultural frameworks will be the source for the cultural data, other institutions and websites will be consulted regarding country eReadiness (WEF) and communications (ITU).

**Relationship measures**

Ideally, to avoid common method bias, separate instruments will be utilized to gather data for the predictor (digital integration) and criterion (relationship performance) constructs from different individuals. These individuals might belong to the same organization at different levels of supervision. The top level officials would be asked about the criterion variables, while the lower level officials, would be asked about the predictors.

**Participants recruitment**

The study requires organizations that engage in international business. Ideally, these organizations will present location diversity –i.e., many different countries, with no dominant country in absolute terms. Additionally, MNCs are to be treated as local to the country with control over the relationship, so relationships that are globally controlled are not suitable for the study.

**Data Analysis**

Structural equation modeling (SEM) techniques will be utilized for testing the micro-integration-outcome model (Bollen, 1989, Joreskog and Sorbom, 1993, Wold, 1975). Given that most of the variables have only one indicator, partial least squares might be a more appropriate technique for the study.

**CONTRIBUTIONS**

The proposed study presents an integrative framework that combines four types of structural influences and two levels of analysis, while at the same time maintaining a manageable level of parsimony. It is novel in that it integrates macro and micro level data in an attempt to explain interorganizational integration via ICT. While many researchers have advocated for

multilevel studies, involving cultural and economic aspects at national and organizational levels, few researchers have done so.

The study is also novel in its approach to cover the full range of embeddedness types. Studies to date that embraced the concept of embeddedness have focused only on a part of the framework –e.g, structural embeddedness–. The study will also test the organizational cultural model across different cultures.

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