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# An Empirical Investigation of E-business Standardization Initiatives: Enablers and Barriers of Industry-Wide Collaboration in Industry Standard Consortia

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## ABSTRACT

E-business standards are important to electronic commerce. In many industries, they are collaboratively developed in a neutral consortium. To a larger extent, the sustainability of an industry standard consortium depends upon its members' financial and technical contribution. Therefore, it is imperative to understand factors that motivate or hinder firms' collaboration in e-business standards consortia. We propose an organization-industry standard consortia-environment framework to investigate enablers and barriers of industry-wide collaboration in standard consortia. We will validate the framework using survey data collected from members of multiple neutral e-business standard consortia. We expect to make both theoretical and managerial contributions. Theoretically, we can understand firms' motive behind the private provision of a public good, as many e-business standards provided by industry standard consortia are freely available and thus exhibit public good properties. Managerially, we will help consortia find effective ways to encourage firms' contribution and help firms to value their consortia membership.

## Keywords

E-business standards, industry standard consortia, collaboration, enablers, barriers

## INTRODUCTION

To remain competitive in today's global economy, firms increasingly rely on e-business applications to extend their focus beyond the efficiency of their internal operations to that of the collaboration with their trading partners and managing a cooperative and interoperable supply chain network. As a result, they have come to understand the value of having common standards for e-business transactions in a supply chain, as standardization enables electronic interchange to be repeated with a set of partners easier, faster, and less costly. An indispensable infrastructure underlying today's electronic commerce, e-business standards "delineate formats of electronic data and information communication" within and across firms' boundaries (Zhao, et al., 2005) and "address product identification, data definitions, business document layout, and/or business process sequences" (Wigand, et al., 2005). In many industries, developing common standards to facilitate interfirm information sharing has been recognized as the foremost issue to tackle in order to increase efficiency in supply chain management. ZapThink, an IT consultancy, predicts that expenditures on e-business standards will reach over \$8.3 billion by the end of 2005 and more than \$43 billion by 2010 (TowerGroup Survey, 2005). Furthermore, e-business standardization is an important research topic in information systems. E-business standards play an important role in creation and adoption of information systems, however, "the role has been understudied in the MIS area" (West, 2003). Researchers have realized the gap between MIS and standard research. Several leading MIS academic journals, such as MIS Quarterly and Electronic Markets, have devoted special issues to standard research in the MIS area.

There are three basic standardization mechanisms, de facto standards, de jure standards, and standards developed by consortia (David and Greenstein, 1990). In many industries, e-business standards are collaboratively and voluntarily developed and promoted in a neutral industry standard consortium. Examples include MISMO in the mortgage industry, ACORD in the insurance industry, RosettaNet in the hi-tech industry, and CIDX in the chemical industry (Nelson, et al., 2005). The popularity of consortium-based e-business standardization reflects the need of inter-firm information sharing and collaboration in the networked economy. For example, in the travel industry, travelers are increasingly booking their trips online. Due to the travelers' expectation to book everything including air tickets, car rentals, tours and show tickets, etc. in a one-stop fashion, a travel site must be able to integrate such information from different travel operators seamlessly.

Consortium-based standardization also mitigates confusion and costs of the technical selection among competing standards in the market.

While industry standard consortia have become a leading force in e-business standardization initiatives in many industries, they are frequently subject to poor performance and high instability. To a large extent, the sustainability of a standard consortium depends upon its members' financial and technical contribution and support. Many industry standard consortia obtain most of their fundings from their members through membership fees. In addition, member's knowledge and experience in information technologies and e-business processes are key inputs for collaborative standard development in the consortium. In return, standard consortia make sure that their standard specifications address the majority's needs and preference by carefully designing the consensus-seeking procedure to encourage firms' contribution to the standardization effort, which is essential to help the standard to achieve the critical mass needed for wide adoption.

Therefore, as one of the important success factors for industry standard consortia, it is imperative to examine firms' motivation to participate and collaborate with one another. In this paper, I propose to empirically examine firms' motivations to participate in the consortia and how they are affected by the characteristics of the firm, the standard consortium, and the external environment. For example, we know from anecdotes and industry reports about various strategies employed by consortium members. Some firms actively participate in standard working groups and choose to lead the development process. Others act passively and meet the minimum requirement of going to meetings and membership dues. Still others "free-ride" by observing the consortium's activities and rarely get involved (Spring and Weiss, 1994; Uppegrove, 2005). However, it is unclear why firms choose different strategies working in standard consortia and how factors such as firms' technical capabilities and standard consortia' management affect the decision. The picture painted by anecdotal and unscientific reports may be biased given its origin from the standard consortia themselves. It is necessary to empirically examine such issues to understand the real incentives to participate (or not). To the best of our knowledge, our proposed study is the first empirical investigation that explores enablers and barriers of industry-wide collaboration in industry standard consortia.

## LITERATURE REVIEW

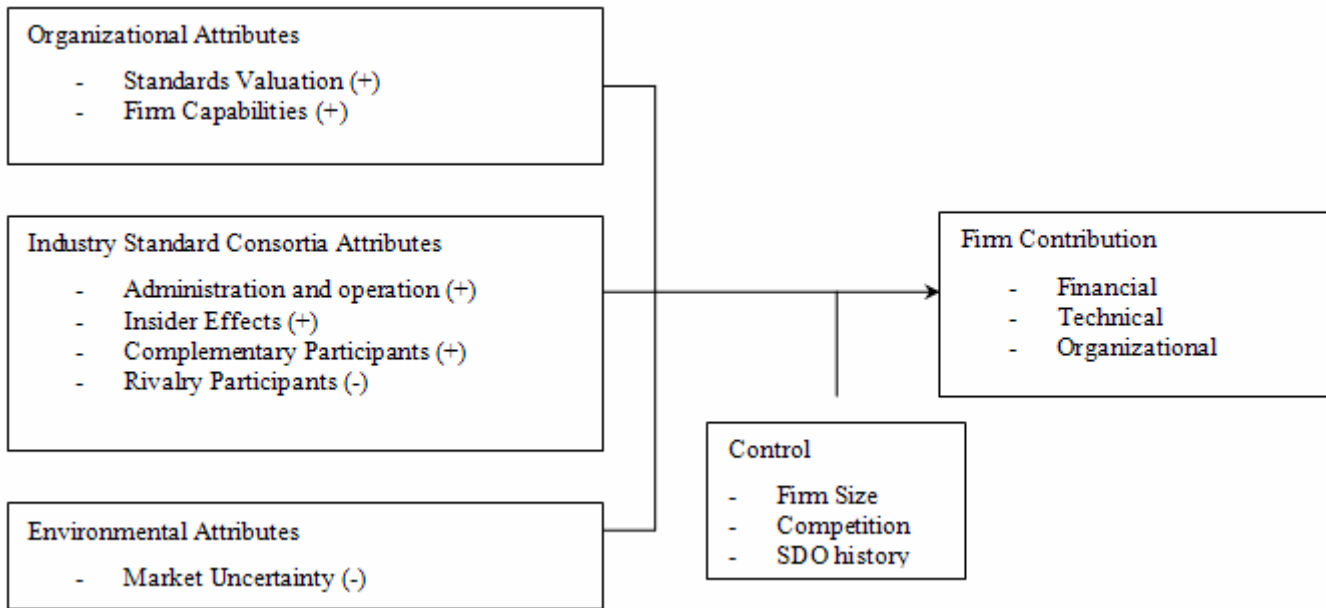
Earlier standard consortia studies have examined the non-market standardization process through different methodologies. Farrell (1996) and Simcoe (2003) develop game theoretical model to find out what causes delays in the standard development process in consortia. Their works explicitly show that participants have vested interests, which affect firms' strategies in the consortia. Several case studies explore administrative and operational details of individual standard consortia (Cargill, 1989; Wigand, et al. 2004). Weiss and Sirbu (1990) conduct a survey to examine various factors affecting standard choices within consortia. These consortia studies help us to identify important organizational features of standard consortia, such as consortia's management efficiency. In this paper, we will develop measurement of key consortia operational attributes and establish and examine connections between consortia characteristics and firms' motivation to work in them.

Previous studies of cooperative R&D consortia also provide a useful theoretical foundation for us, since both standard consortia and R&D consortia are a special organizational form where a group of firms, even competitors, collaborate with each other to fulfill certain tasks. As suggested by cooperative R&D consortia studies (Katz, 1986; Sakakibara, 1997 & 2002), both firm characteristics and external environment, such as market competition and firms' capabilities, have impacts on firms' participation in cooperative R&D consortia. Interorganizational learning and skill-sharing are also an important reason behind the formation of strategic alliances, including standard consortia and R&D consortia (Sakakibara, 1997 & 2002; Carson, 2003). Nevertheless, standard consortia and R&D consortia are also different in terms of organizational goals and internal processes. Our study will complement cooperative R&D research by analyzing industry-wide collaboration in a different consortium setting.

We have also developed a game theoretical model to investigate the endogenous formation of industry standard consortia (Zhao, et al., 2006). The model reveals two-sided interactions between the standard development stage and the standard adoption stage. During the standard development stage, there are three factors related to firms' investment in standard consortia: firms' standard valuation, development cost within the consortia, and insider effects. Firms who stand to gain the most from a standard have the strongest incentive to contribute at the highest level (Spring and Weiss, 1994). Firms' contribution in standard consortia is negatively related to the cost working with each other to develop the standard and positively related to insider benefits a member can enjoy from consortia memberships. These findings provide us additional insights in understanding firms' motive to work in e-business standard consortia.

**A CONCEPTUAL FRAMEWORK**

Based on previous literature, we propose an organization-industry standard consortia-environment framework (Figure 1) to study factors that motivate or hinder firms’ contribution and collaboration in e-business standard consortia.



**Figure 1: A Conceptual Research Framework**

**Firm contribution:** Firms’ contribution to standard consortia can be measured as financial input, technical input, and participation in consortia organizational and administrative activities. Firms dedicate financial resources to support consortia operations. They submit standards proposals and technical requirements to the consortium, join technical discussion through both face-to-face meetings and online channels, and share feedback of standards implementation with other members. From organizational perspective, firms can choose whether or not to join the steering committee and control the strategy and direction of the consortium.

**Organizational attributes:** We expect that firms with higher valuation will become more involved in consortia activities since they can speed up the development and adoption process of e-business standards and propose standards close to their own vested interests. Benefits and positive experience from implementing the standard can further encourage firms to collaborate in consortia and develop standard specifications covering more digital business processes.

While firms are willing to join various consortia activities, their capabilities will constraint the extent of their contributions. Firms need both financial and technical capital to invest in a standard consortium. Financial resources will be used to pay for membership fees, attend meetings, and support delegates to work and negotiate within consortia. Technical resources refer to the level of accumulative knowledge of e-business standards (Chwelos, et al., 2001) and previous standard consortia experiences. Only firm with standard know-how can involve in-depth technical discussion during the development process. Firms’ experience of past consortia participation can help them better manage political interactions within the consortium. Top management support is also expected to associate with firms’ involvement in standard consortia.

**SDO attributes:** The efficiency of a standard consortium’s management and internal processes is helpful to achieve coordination among members (Farrell, 1996), reduce the duration of the standard setting processes, and increase participants’ satisfaction. Firms are more likely to devote their resources to a more efficient standard consortium.

By working in the standard consortia, firms can enjoy insider effects. For example, they can skew the standards towards their individual preference, receive advanced knowledge of the direction of standard setting, accumulate standards-specific knowledge and expertise, and make the future adoption process smoother. The more insider effects a firm can receive from participating in the consortium activities, the more motivation a firm has to contribute to the consortium.

In addition, standard consortia also provide firms opportunities to learn from others (Carson, 2003) and obtain potential patternship or business opportunities. As a result, complementary participants will encourage firms’ investment in the standard consortium. However, when firms try to reach agreements over competing standard ideas, the war of attrition might

happen. Firms may have conflicting interests and viewpoints (Simcoe, 2003). Information leakages exist that firms may disclose trading secrets and proprietary technologies to competitors and even potential ones (Fomin, et al., 2003). Therefore, we expect that a firm's motivation to invest in a SDO decreases with the extent of rivalry in the consortia.

**Environmental Attribute:** Firms working in a standard consortium always face risks due to market uncertainty. Standards may be developed during a period of technology ferment (Gosain, 2003). Future diffusions of standards may become difficult or even fail due to competition from rival consortia or individual vendors (Weiss and Cargill, 1992). Therefore, we expect that a firm's contribution in a standard consortium is negatively related with the market uncertainty the consortium is facing.

## METHOD

We have developed a survey questionnaire to collect firm-based cross-sectional data from organizational members of e-business industry standard consortia. To control the heterogeneity of standard consortia, our targeted standard consortia should satisfy the following conditions: (1) a non-profit, neutral and open consortium setting; (2) standards are used for electronic data and process communication within and across organizational boundaries; (3) standards are industry specific; (4) standards setting are based on a consensus seeking approach that incorporates openness and balance of interests. Considering the low response rate of a survey, we focus on standard consortia with a sufficient number of organizational members (>100).

We have asked our colleagues, who have plenty of survey experience, to review and criticize our questionnaire design. To further test the feasibility of our survey, we have conducted a pilot study. Open Geospatial Consortium (OGC), a leading standard consortium in the geospatial and location based services industry, has agreed to distribute our online-based survey among their members. From the preliminary data and responses, we find that our survey questions are realistic and easy to understand. Our newly-designed survey instrument captures members' different levels of involvement in the OGC. Moreover, our research procedure, i.e. sending out survey through standard consortia, is workable since it ensures that respondents are people representing their organizations to work closely with targeted standard consortia.

We are conducting the full-scale study. We will contact targeted standard consortia and ask for their cooperation to promote and distribute our online survey among their members.

## EXPECTED CONTRIBUTIONS

We expect our study to make two theoretical contributions. First, it will shed light on understanding industry-wide collaboration, as industry standard consortia are "a forum of collaborative technology development and a catalyst of industry coordination" (Simcoe, 2003). Secondly, we expect to better understand firms' motive behind the private provision of a public good, as many e-business standards provided by industry standard consortia are freely available to all potential users and thus exhibit public good properties (Zhao, et al., 2006), e.g. MISMO specifications and RosettaNet PIPS. For public goods jointly supplied by individual members, free riding is a common concern. As we have discussed before, firms choose various tactics in industry standard consortia. While free riders may exist, there are firms who devote financial as well as technical resources to develop standards. Our study is helpful to differentiate firms' strategic choices in standard consortia and explain rationale behind their choices.

Our work will also provide managerial guidelines for both industry standard consortia and individual firms. Our result on motivations of participation will help consortia find effective ways to encourage firms' contribution to the consortium in order to achieve continuous development and success. Our research will also aid consortia initiators and managers to identify potential interested parties and contributors in the industry. For individual firms, our research will provide a framework to guide companies' strategic decision in participating in e-business standard initiatives, as standard choice and standards adoption have become a critical part of managing a firm's IS function. It will also help firms to better understand the value of their standard consortium memberships.

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