Research Report

The Adoption of Inter-Organizational Systems in Financial Services

NEW TECHNOLOGIES LIKE GRID COMPUTING WHICH CAN CONNECT RESOURCES AT DIVERSE LOCATIONS ARE MORE AND MORE ADOPTED FROM ORGANIZATIONS. SUCH TECHNOLOGIES CAN BOTH TRIGGER LINKAGES BETWEEN ORGANIZATIONS AND DIFFERENT DEPARTMENTS IN ONE SINGLE ORGANIZATION. WE DEVELOP A MODEL WHICH ACCOUNTS BOTH FOR INTER- AND INTRA-ORGANIZATIONAL INFLUENCE FACTORS ON THE ADOPTION PROCESS AND EMPIRICALLY IDENTIFIES THE MOST SIGNIFICANT INFLUENCE FACTORS.

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Motivation

Over the last decade, a fundamental transformation has taken place as a networked economy has evolved in which multiple organizations collaborate and create supply chains or value networks (e.g., think of the dwpbank executing the securities settlement for a number of competing banks). Such networks constitute webs of relationships that generate both tangible and intangible value through complex dynamic exchanges between two or more organizations. Any agent engaged in these kinds of exchanges can be viewed as a value network in itself, whether in private industry, government or the public sector. This has given rise to important questions regarding the adoption of new technology in such a closely collaborating and networked economy. Most of the literature on the adoption of IT in organizations has focused exclusively on the characteristics of a single firm and the properties of the technology being adopted. We, however, observe that new technologies can also cross the boundaries of the firm, and thus the co-creation of IT value is an important topic for future research. Hence, it is necessary to understand how IT is also adopted among multiple partners in an inter-organizational relationship. The adoption of a new technology can begin with the commitment of all network partners, but more often a single firm starts to adopt the new technology and then the adoption is imitated by cooperating or competing firms. The adoption of the technology thus crosses the firm's boundary and the diffusion process starts. The adoption should be seen as a process of social contagion where the adoption decision depends on the evaluation of other firms in the network. As outlined by Granovetter (1985), economic life is embedded in social relations. The focus on the atomic behavior of individual agents neglects the social interplay between different agents. It has been shown that social contagion occurs among prospective adopters in different contexts and that relationships significantly influence the adoption decisions of their peers. Thus, technology adoption models have to incorporate these social relations to be able to derive valid predictions. Based on institutional theory, adoption models were designed and tested that accounted for inter-organizational influence factors by analyzing mimetic, normative and coercive pressures through which surrounding institutions may force organizations to adopt FEDI (Financial Electronic Data Interchange). However, many innovations can be beneficial for a single firm even when their peers do not adopt them. The adoption may start within a single firm, and its benefits may increase later when the adoption crosses the firm's boundary, e.g., due to network effects.

Since little is known about the success factors in such a setting, which is an important precondition for a successful implementation, we examine the adoption of inter-organizational systems.

Inter-Organizational Systems

An Inter-Organizational System (IOS) can be defined as an information and management system that crosses organizational boundaries via electronic linkages with trading partners. The purposes are to share data, business applications, and information, and to provide business partners with electronic transaction capabilities for buying and selling goods and services.

Within large firms, organizational units can be single departments, and IOS can also be installed for a single firm, linking the departments within the firm. The top management can agree upon the deployment of an IOS without initially considering its inter-organizational (i.e., outside the boundary of the firm) benefits. Fig. 1 depicts Firm 1 deploying an IOS to connect its different departments (organizational units) because there is some derivative utility for the firm. In a second step, Firm 1's supplier adopts this IOS to improve its collaboration with Firm 1. This adoption might also trigger the adoption of the system by a competitor. Another instance of the diffusion process could be triggered by a consortium's agreement upon the deployment of an IOS for the entire supply chain.

There are numerous examples of IOS, and this kind of system is gaining increasing importance. Actually, nearly every Personal Computer based piece of software with export functionality possesses such properties. For example, Firm 1 could decide to install new spreadsheet software in their departments. This software has a derivative utility for each single department, but also benefits from network effects. The utility increases when the supplier also decides to install this software, as data can then be exchanged and shared more easily.

Other examples are the Internet and its related technologies, SAP R3, operating systems, and technologies like grid or cloud computing. The latter two are technologies that allow to share computer resources via the internet for computational purposes instead of using only software, storage or the computational power of the local PC. Especially grid computing seems interesting for the financial service industry for outsourcing computational tasks. We therefore focus on grid computing in our empirical study.

Representative Sample of IT Decision Makers

From the end of May until the beginning of July 2008, 2,538 potential participants in an online panel which consisted of IT decisionmakers in German industries were invited to respond to our online survey. To obtain a significant sample, all participants had to pass through a screening process. Participants had to fulfill three conditions: 1.) They had to occupy an executive position in their firm, 2.) They had to be responsible for the IT budget of (at least) their department, 3.) The firm had to have at least 50 employees.

Drivers for Adoption of IOS

It has been shown that the properties of organizations and the capabilities existing in these organizations have a strong influence on their intention to adopt new technologies. Capabilities can be a source of competitive advantage, but they also define the constraints of the degree of a structural change. We find a number of intra-organizational capabilities that have a significant influence on the intention to adopt grid computing technology. While firm size does not have a significant effect on the adoption of grid computing, the size of the IT department is a vitally important driver of the intention to adopt. This is a very interesting finding: It seems that larger IT departments have more human capabilities and expertise to accomplish the implementation of a new technology in the existing IT structure. Perceived resource scarcity does not show a significant effect on the adoption intention. The observed organizations seem to be equipped with sufficient IT resources so that they do not need access to the IT resources of other organizations via a grid. This is in line with the reported high fraction of idle resources in the industry. As shown before, their main interest may be the efficient balancing of existent IT resources or the opening up of new business opportunities through increased computational power.

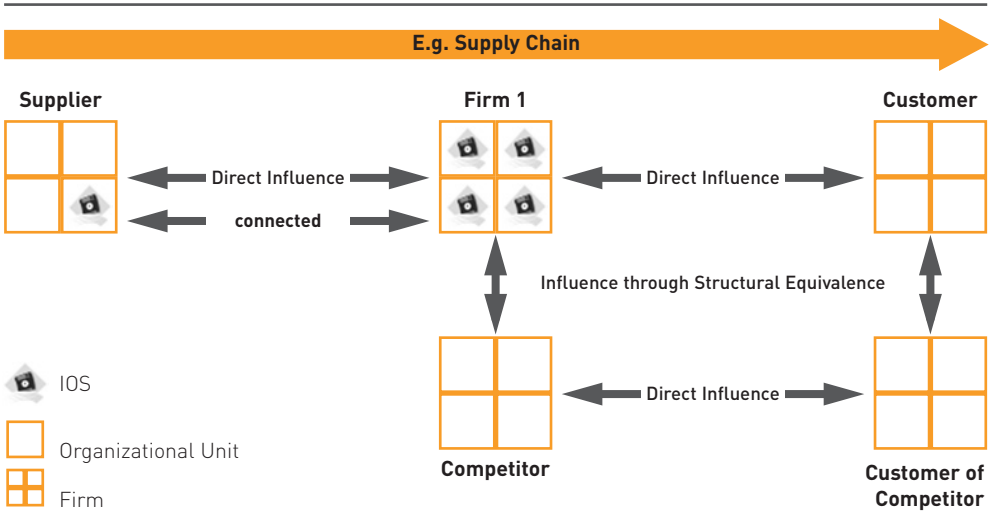

Figure 1: IOS in an Inter-Organizational Environment

The strongest positive effects within the intra-organizational influence factors are due to the innovativeness of the organization. Innovativeness is measured as management-related innovativeness and personnel-related innovativeness. In the case of serious changes such as the paradigm shift to grid computing, the project needs to be backed by the management, and thus the innovativeness of the management is an important driver for the adoption of this technology. The personnel-related innovativeness, however, seems to be even more important. If employees are innovative, they are also willing to adopt new technologies, while employees who are very conservative and cautious regarding innovations prefer familiar work processes and tools and may refuse to use the new technology. If an organization is open-minded about new practices and supports its employees in working with or thinking about new technologies, it has a stronger intention to adopt new technologies. The strong and significant positive effect of innovativeness on the adoption intention corroborates this argumentation. At a first glance, this outcome might be regarded as trivial, but it shows that although the idea of grid computing is more than 10 years old and its advantages are obvious, it is still regarded as an innovative and not as an established technology by the respondents of our survey. Another driver for the adoption of networked technology is trust. Trust in our case is a two-dimensional factor which includes trust in the technology itself and trust in the participants in a grid. Both factors contribute to the trust in this innovation, which is a pre-condition for a high intention to adopt. Interestingly, privacy concerns are not regarded an important problem; their influence on the intention to adopt can be neglected.

These findings illustrate that intra-organizational factors are important predictors for technology adoption processes. However, individuals as well as organizations are uncertain about new technologies as they become available on the market. This uncertainty is reduced as additional information becomes available. Certainly, this information is not exogenously given; it diffuses through the environment of the firm and can be gathered in communication with suppliers and/or customers or by recommendations from business or trade associations. Observing the actions of competitors might also influence the adoption process. There are different sources for such relevant information, which we summarize as inter-organizational factors.

Among the inter-organizational influence factors, coercive pressure shows the strongest effect on the adoption of grid computing. This means that dominant suppliers, customers, or parent companies can exert pressure on organizations to adopt this new technology. Hence, organizations must adopt the technology because their suppliers, customers, and parent corporations coerce them to do so. Especially in times of crisis, cost savings arguments can bring companies to use their resources more carefully. A similarly strong effect is measured by mimetic pressures. If the competitors of an organization have already adopted grid computing and suc-

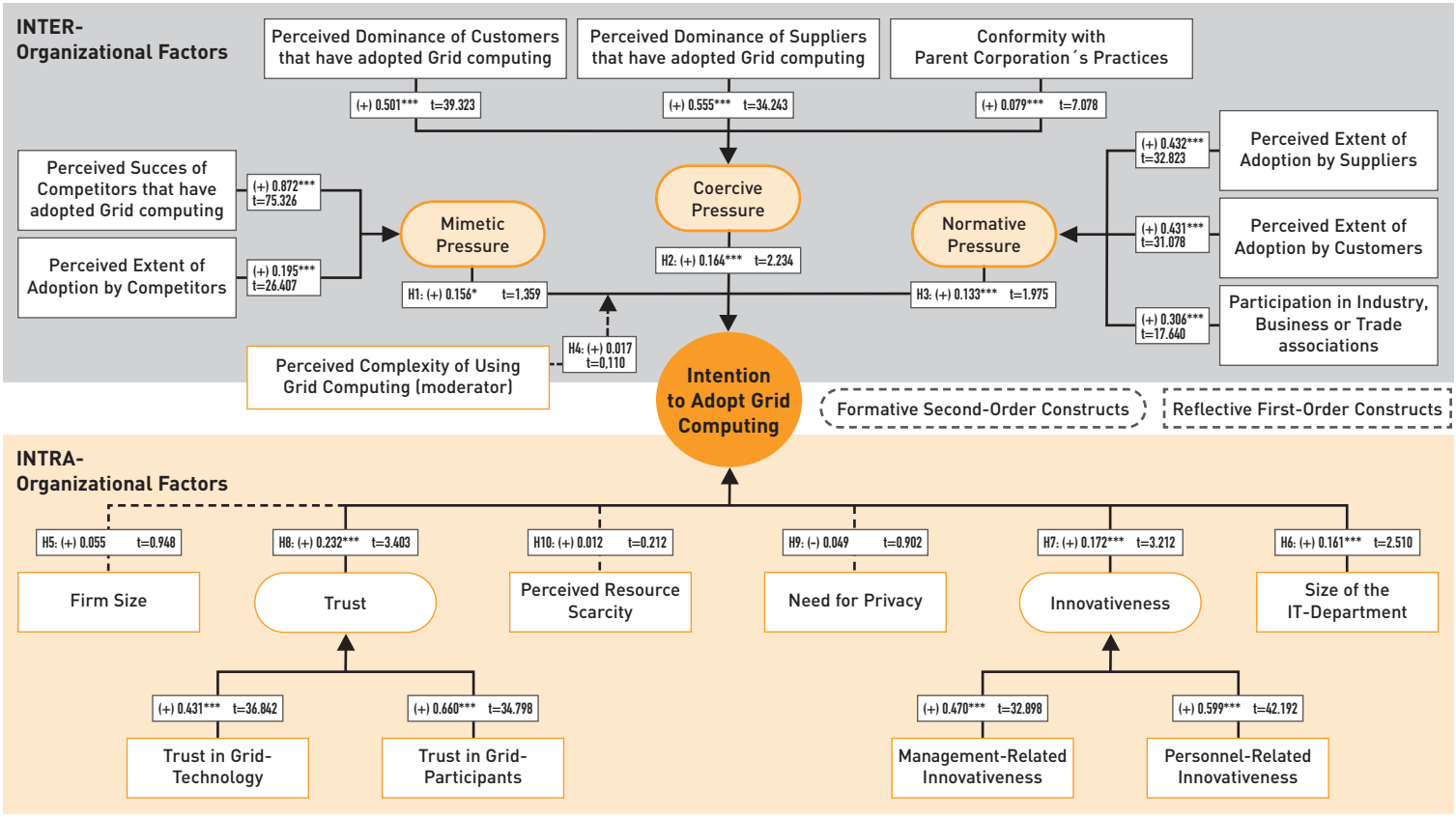

Figure 2: Resulting Path Model (*p<0.01, **p<0.05, *p<0.1)**

ceeded with it, the observing organizations are forced to follow along and benefit from its advantages, so as to avoid competitive disadvantages. The perceived complexity of using grid computing does not significantly moderate the effect of mimetic pressures on the adoption intention. Even when the complexity is perceived as high, the effect of mimetic pressures remains unchanged.

Normative pressures are also at work, although they are somewhat weaker in the case of grid computing adoption than mimetic and coercive pressure. The normative pressure is more indirect and can emerge through observing the spread of adoption within their business environment. In this case, firms want to avoid losing important suppliers and customers for being regarded as technologically backward.

In summary, the intention to adopt grid computing can partially be explained by inter-organizational factors. Organizations exist within a social environment, and social contagion influences the propensity to adopt new technologies (see Fig. 2 for results).

Conclusion

Our study illustrates that the properties and capabilities of the firm are one part that influences the intention to adopt new technologies. We show, for example, that properties and capabilities such as innovativeness are important antecedents for the intention to adopt. Firms are, however, part of a business network and therefore embedded in a social environment. Information reaching the firm through this social environment might put pressure on the particular firm. If competitors successfully introduce a new technology or collaborating firms report benefits that can be realized with new technologies, this exerts pressure on the firm which influences the intention to adopt the same technologies. As grid computing is an IOS providing both inter-organizational and intra-organizational linkages, both factor domains need to be considered when examining the adoption intention. By including inter- and intra-organizational influence factors, we explained 53.3% of the variance in the adoption intention, which is substantially higher than similar adoption models. This outcome indicates that intra-organizational influence factors should not be disregarded in the context of IOS adoption.

With the rise of a networked economy, we expect that the focus of research will further shift away from treating firms as atomic agents since firms are embedded in a social context which heavily influences decision making in the particular firm.

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