Determinants of Grid Assimilation in the Financial Services Industry: An Institutional Theory Perspective

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<tr>
<th><strong>Journal:</strong></th>
<th><em>18th European Conference on Information Systems</em></th>
</tr>
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<tr>
<td><strong>Manuscript ID:</strong></td>
<td>ECIS2010-0108.R2</td>
</tr>
<tr>
<td><strong>Submission Type:</strong></td>
<td>Research Paper</td>
</tr>
<tr>
<td><strong>Keyword:</strong></td>
<td>Technology assimilation, Diffusion of innovation, Institutional theory, Banking IS</td>
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DETERMINANTS OF GRID ASSIMILATION IN THE
FINANCIAL SERVICES INDUSTRY – AN INSTITUTIONAL
THEORY PERSPECTIVE

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Abstract

Financial services providers are exposed to different sources of institutional pressure arising from the intensive competition and regulation in the banking sector. Against this background, Grid technology assimilation can be seen as a potential strategic response to increasing requirements in terms of complex new financial products, the assessment of arising risks, and sophisticated investment strategies. However, so far little empirical research has been conducted to quantify the determinants of Grid assimilation in the financial services industry. Grounded in the technology-organization-environment framework, this article provides a holistic perspective on the determinants of Grid assimilation and the role of institutional pressure in the assimilation process. The derived hypotheses were tested based on 197 complete responses from IT decision makers of financial services providers that already have implemented Grid technology. The results from partial least squares analyses suggest a strong positive impact of mimetic and normative pressure on Grid assimilation, but surprisingly do not support the hypothesized strong relationship of coercive pressure on Grid assimilation. The derived and validated conceptual model contributes to the diffusion of innovations and IS assimilation theory by further integrating institutional theory into the technology-organization-environment framework.

Keywords: Technology assimilation, Diffusion of innovation, Institutional theory, Banking IS.
1 INTRODUCTION

In line with most businesses’ strategies, enterprises increasingly adopt value chain improving technologies in order to retain a competitive position in a rapidly changing, uncertain and demanding environment (Sugumaran et al. 2008). In this environment, firms continuously search for organizational legitimacy extensively impacting on their structural and behavioural changes (Meyer & Rowan 1977). Due to its hyper-competitive market and high regulatory pressure, especially the financial services industry is exposed to a high level of institutional pressure, that forces firms to comply with societal and regulatory norms (Ang & Cummings 1997). Moreover, the financial services industry exhibits information-intensive business processes, high computational demands, and fast changing customer needs (Hackenbroch & Henneberger 2007). These industrial characteristics are reflected by its above average annual IT investments (~8% of the annual revenues) which is almost as twice as high as in other industries (Zhu et al. 2004). One way to meet arising institutional and computational challenges is the assimilation of a Grid-based IT architecture (Foster & Kesselman 1999) that facilitates the ability to accelerate resource-demanding computations and data mining operations. Following the widely accepted definition by Foster (2002), a Grid-based IT architecture is a system that coordinates IT resources that are not subject to centralized control, uses standards, open protocols and interfaces, and delivers non-trivial qualities of service. By these general means and the aforementioned computational and data mining capabilities, the timely assessment of complex financial products and available risk exposure becomes feasible (Hackenbroch & Henneberger 2007), eventually fostering regulatory compliance and organizational legitimacy. Furthermore, service-oriented Grids enable firms to adaptively change processes and procedures “on the fly” by providing a collaborative, service-oriented, scalable, and cost-efficient infrastructure. Due to a multi-national study by Quocirca (2006) the current adoption rate of so-called compute Grids is estimated to be around 10 to 30 percent whereas the geographical dissemination significantly varies between the US (high adoption rate), Europe (moderate adoption rate), and Asia (low adoption rate).

So far, little empirical research has been conducted to identify and quantify the core determinants of Grid assimilation as potential strategic course of action in the financial services industry (Hackenbroch & Henneberger 2007). In order to conceptualize the critical role of institutional pressure (mimetic, coercive, normative) driving the assimilation process in the financial services industry, we draw on institutional theory to amend the environmental component of the technology-organization-environment (TOE) framework. The remainder of the article is organized as follows: section 2 briefly introduces the required domain knowledge with regard to the utilization of service-oriented Grids in the financial services industry. Furthermore, the theoretical background and the appropriateness of the TOE framework and institutional theory for the stated research approach are depicted. Based on this, the derived hypotheses and the conceptual model are developed in the subsequent section. In section 4, the research design and methodology of the conducted quantitative field study are depicted, concluding with a discussion of the main results. Finally, the article concludes with an overview of the existing limitations and further research opportunities to extend the depicted work.

2 THEORETICAL BACKGROUND

2.1 Service-oriented Grids in the Financial Services Industry

During recent years, enterprises continuously build-up their own Grid infrastructures by transforming their former vertically integrated IT infrastructures (e.g. compute clusters, databases, etc.) to horizontally integrated, service-oriented architectures (SOA) built on a set of loosely coupled software services (Foster & Kesselman 1999). In general, Grid infrastructures can be characterized by a set of latent properties that extend those of traditional compute clusters. These properties provide a variety of benefits that include:
Seamless computing power achieved by exploiting under-utilized resources to solve compute-intensive problems in a decreased processing time

- A faster access to distributed data
- On-demand provisioning of geographically dispersed, heterogeneous resources
- A reliable, resilient, and highly available infrastructure with autonomic management capabilities and on-demand aggregation of resources from multiple sites to meet unforeseen demand

These characteristics of service-oriented Grids are especially exploited in the financial services industry for compute-intensive processes, e.g., the new (financial) product development process, the risk management process, and the asset management process. Furthermore, this demand can be assumed to be further reinforced by the current financial crisis which leads to high regulatory and competitive pressure to utilize complex forecasting and analyzing tools, which can be fostered by a “gridification” of the existing enterprise architecture landscape.

2.2 Technology-Organization-Environment Framework

The TOE framework (Tornatzky & Fleischer 1990) is consistent with the diffusion of innovations theory (Rogers 1995) which emphasizes technological differences, internal, and external organizational characteristics as main drivers for organizational technology diffusion. Thus, the TOE framework identifies three different contextual aspects of a firm that determine the process of technological assimilation on the firm level of analysis: the technological context, the organizational context, and the environmental context. While technological context relates to the IT infrastructure and information systems that are internally or externally available to an organization, the organizational context is defined as the characteristics that shape an organization. Finally, the environmental context captures the setting in which an organization conducts its business. So far, the TOE framework has been successfully utilized in different prior (post-)adoption studies on IT diffusion on the firm level of analysis, e.g., E-Business (Zhu et al. 2006) and EDI (Kuan & Chau 2001). Due to their different purposes, IT innovations can be distinguished based on Swanson’s (1994) classification. While type I innovations represent purely technological driven innovations (e.g., database systems), type II innovations involve the technological support of administrative tasks (e.g., payroll or human resources systems). Since service-oriented Grids eventually foster the development of advanced data processing, data mining, and (inter-)organizational collaboration capabilities, they exhibit the potential to be integrated with the core business model of firms. Due to this potential of generating strategic value, service-oriented Grids can be classified as type III innovations, which encompass innovations potentially affecting the entire business. Furthermore, Swanson (1994) evaluated the appropriateness of the TOE framework for the different types of innovation, finding that the facilitating technological infrastructure, organizational attributes such as slack resources, and the strategic environment have an impact on type III innovation diffusion. Additionally, type III innovation studies are still rarely covered by prior literature. Thus, we deemed the TOE framework appropriate for our study.

2.3 Institutional Theory

Since financial services providers are especially exposed to a high level of institutional pressure due to its hyper-competitive and highly regulated market, the financial sector exhibits the special opportunity to study strategic responses of financial services providers and the impact of institutionalization (Ang & Cummings 1997). Institutional theory in general posits that structural and behavioural changes in firms are rather driven by an inherent organizational need for legitimacy than sole considerations of competitive advantages and hidden efficiency potentials (DiMaggio & Powell 1983, Meyer & Rowan 1977). This continuous search for organizational legitimacy eventually facilitates the process of institutionalization and organizational isomorphism especially against the background of an uncertain and turbulent environment. Due to DiMaggio and Powell (1983) basically three different types of institutional pressure can be distinguished. An uncertain environment especially fosters mimicry
among firms. Thus, even if the consequences and goals of an innovation are poorly understood or are ambiguous, **mimetic pressure** can foster the assimilation of it, if adopting firms are perceived as successful by the environment. **Coercive pressure** arises from societal expectations in a broader sense where firms try or have to conform to expectations, policies, or regulation from the government, customers, or the competitive environment. Finally, **normative pressure** arises from the ongoing process of professionalization, which is further enforced by the close collaboration with suppliers, business partners, and governmental promotion. However, there is a critical discussion in the extant literature on the implied passiveness of firms towards external pressure as posited by institutional theory (Ang & Cummings 1997). As a consequence, the ability of a firm to strategically respond to institutional pressure is underestimated. Here, Grid technology assimilation exhibits a potential to simultaneously comply with arising institutional pressure and nevertheless improve the competitive position (Hackenbroch & Henneberger 2007). Several studies have emphasized the role of institutional pressure on the intention to adopt EDI (Teo et al. 2003) and the assimilation process of ERP (Liang et al. 2007) in a very focussed context. Still, there is only few research partly integrating the institutional pressure conceptualization into the holistic TOE framework (e.g., Zhu et al. 2006). To our knowledge, so far there is no study that extensively integrates institutional theory into the holistic approach of the TOE framework to assess the IT assimilation process on firm level. In terms of the domain of service-oriented Grid assimilation, there is no quantitative empirical study identifying and quantifying the determinants of Grid assimilation in the (financial services) industry.

### 3 RESEARCH MODEL AND HYPOTHESES

Based on the TOE framework and deductively drawing from extant literature, the determinants shaping Grid assimilation on the firm level of analysis were conceptualized in a parsimonious model as depicted in Figure 1.

![Research Model](image)

**Figure 1.** Research Model; *p < .05 (two-tailed)
The technological context is represented by Grid infrastructure capability and Grid technology integration (adapted from Zhu et al. 2006). Grid infrastructure capability captures the firm’s technical capability resulting from having extensive access to distributed computing power and purpose-specific technologies (e.g. a high-capacity, low latency network) within the organization. In the first place, these technologies enable a firm to adopt and implement a Grid, since a technological infrastructure reflects the platform on which Grid applications can be built (Foster & Kesselman 1999). Thus, we hypothesize

**H1**: Firms with greater Grid infrastructure capability are more likely to be in an advanced stage of Grid assimilation

Grid technology integration is defined as the degree of inter-connectivity among applications and the inter- and intra-organizational backend systems or architectures. This is expressed by the access of applications to standardized enterprise integration architectures, virtualized environments as execution environment, or the integration of external IT resources. In this case a “gridification” and migration of existing legacy systems becomes easier. Since technological integration leverages the potential advantages of Grid-based infrastructures to existing applications, Grid technology integration is vital for a successful assimilation of Grid technology. Thus, we hypothesize

**H2**: Firms with greater Grid technology integration are more likely to be in an advanced stage of Grid assimilation

The organizational context encompasses Grid technology competence (adapted from Zhu & Kraemer 2005), Grid implementation management capability (adapted from Dong et al. 2009, Pavlou & El Sawy 2006), and firm size (Tornatzky & Fleischer 1990). Grid technology competence reflects explicit knowledge and skills (e.g., distributed systems programming skills, knowledge of virtualized environments) owned by the firm’s IT staff that are needed to successfully develop Grid architectures and Grid applications (adapted from Ray et al. 2005). Thus, Grid technology competence complements the physical capabilities by human-related factors (Mata et al. 1995) both contributing to the organizational readiness to assimilate Grid technology. Thus, we hypothesize

**H3**: Firms with greater Grid technology competence are more likely to be in an advanced stage of Grid assimilation

Since the organizational readiness to successfully assimilate a technology is not solely defined by technological nor human factors but additionally decisively relies on their integration (Melville et al. 2004), this inherent complementarity and interdependence is conceptualized in a twofold way. First, consistent with the resource-based view of the firm the research model distinguishes between two different kinds of IT resources complementing one another (Melville et al. 2004): technological IT resources (i.e., Grid infrastructure capability and Grid technology integration) and human IT resources (i.e., Grid Technology competence). Second, the interdependence between these complementarities is reflected by the Grid implementation management capability since operational middle management leads the overall Grid assimilation from both a technological and business-driven perspective. This “conversion capability” of the involved IS department reflects the degree of managerial competence to successfully monitor and guide through the process of Grid assimilation. Thus, we hypothesize

**H4**: Firms with greater Grid technology implementation capability are more likely to be in an advanced stage of Grid assimilation

In the diffusion of innovations theory, firm size is a major factor impacting on innovation diffusion (Rogers 1995). Still, there is an ongoing discussion in the extant literature on the role of firm size in the diffusion of innovation process. On the one hand, large firms exhibit a certain level of slack resources further facilitating the diffusion of innovations (Rogers 1995). On the other hand, smaller firms are assumed to be more flexible with regard to innovative technologies (Zhu & Kraemer 2005). In general, a Grid infrastructure requires at least a certain firm size to be implemented in a reasonable manner, since there have to be at least a number of servers which can then be virtualized to a service-oriented Grid. Thus, organizations have to exhibit a certain size to benefit from Grids, wherefore we
administered our study among financial services providers with more than 1,000 employees. Within this group, we assume that smaller firms are more open-minded towards Grid technology assimilation since the inherent risk of reputation losses arising from ill-conceived technological innovation affects well-established and larger firms more seriously than smaller and probably new firms in the financial market. In addition to this, rather small size financial firms may perceive Grid technology assimilation as a strategic action to gain market share compared to their well-established competitors. Thus, we hypothesize

**H5: Smaller firms are likely to be in an advanced stage of Grid assimilation**

The environmental part of the research model is defined by mimetic pressure, coercive pressure, and normative pressure as the main forces driving IS assimilation. **Mimetic pressure** reflects the pressure to imitate structurally equivalent successful organizations in the same industry without necessarily considering a firm-specific context (DiMaggio & Powell 1983). Theses also so-called “bandwagon phenomena” can be induced by competitors in the same industry having already successfully adopted Grid technology and their resulting positive perception by industry. This pressure can be even enforced by a turbulent and highly dynamic environment as exhibited by the financial services industry, which requires continuous strategic re-alignment to ever changing market conditions (Ang & Cummings 1997). Thus, competitors might gain advantages grounded in their advanced Grid assimilation with regard to perceived lower costs, a higher computing power, and an increased scalability. With these (perceived) advantages the pressure increases for any firm in the financial sector to assimilate Grid technology as well. Thus, we hypothesize

**H6: Firms that are exposed to a higher level of mimetic pressure are more likely to be in an advanced stage of Grid assimilation**

**Coercive pressure** is defined by the pressure grounded in societal expectations and dependencies towards other firms (Bela & Venkatesh 2007, DiMaggio & Powell 1983). In case of the financial services industry, regulatory pressure decisively drives or restricts the assimilation of new technologies (Ang & Cummings 1997, Zhu et al. 2006). New regulatory norms, e.g., Basel II, the Sarbanes Oxley Act, or MiFID, require financial services providers to calculate complex (risk) forecasting models and to provide key figures in a timely manner. Besides regulatory influences, also the rapid changing customer demand with regard to new financial products and cost reductions can drive a financial institution to assimilate a Grid early. Thus, we hypothesize

**H7: Firms that are exposed to a higher level of coercive pressure are more likely to be in an advanced stage of Grid assimilation**

Pressure that is rooted in the ongoing process of professionalization is encompassed by **normative pressure** (DiMaggio & Powell 1983). This pressure arises from the exchange of best practices among business partners, suppliers, and the government. Since (financial) value chains consist of several participating entities, the assimilation of a specific technology may also impact the other entities to do the same in order to realize business value (Dong et al. 2009). Also, if one entity exhibits a relatively higher level of professionalization, pressure arises among the involved entities to keep up. Finally, the ongoing information exchange within the value chain provides a firm with access to firsthand experience of Grid technology, its potential advantages and guidelines how to assimilate it efficiently. Thus, we hypothesize

**H8: Firms that are exposed to a higher level of normative pressure are more likely to be in an advanced stage of Grid assimilation**

### 3.1 Measures

Reflective measures were used for all of the constructs except for firm size and Grid assimilation as formative measures. All constructs of the depicted research model were deductively derived from well-established IS journals and were adapted to the Grid context where necessary. Fully anchored 7-
point Likert scales (from 1 (‘strongly disagree’) to 7 (‘strongly agree’)) were used for all reflective constructs except for Grid infrastructure capability and Grid technology integration. These were measured on a 5-point Likert scale (from 1 (‘0%’) to 5 (‘100%’)), since they captured the relative extent of access to specific infrastructure capabilities. For firm size a 4-point ordinal scale for different categories of size (1,000-5,000, 5,001-10,000, 10,001-50,000, >50,000) was employed. Grounded on Rai, Brown, and Tang (2009) originally drawing from Fichman (2001), we conceptualized the Grid assimilation construct as the degree of assimilation regarding the extent to which a firm has progressed through stages of innovation deployment (initiation, adoption, routinization). Since a technology-focused assimilation study on firm level is conducted, an aggregated measure for the assimilation stages is employed. As unit of analysis for measuring assimilation progress a business process level perspective was chosen, due to the fact that IT investments are supposed to first affect the performance of specific business processes (Davamanirajan et al. 2006). In order to identify the key business process being primarily influenced by Grid assimilation in the financial services industry, several expert interviews with IS executives were conducted. Additionally, a careful review of the current banking services landscapes provided by Oracle and the “Banking Industry Architecture Network” (BIAN) was utilized to further ground the set of identified business processes. The finally utilized measure aggregates over the whole assimilation lifecycle of a single technology (i.e., Grid technology) for the three identified key business processes (i.e., new product development process, risk management process, and asset management processes) of a single financial services provider. Therefore, a 7-point Guttman scale (from 1 (awareness) to 7 (general deployment)) is utilized for each of the three business processes (adapted from Rai et al. 2009). Overall, the presented operationalization implicates several benefits, e.g., greater robustness and generalizability, at the cost of a possible loss of context specificity, and reduced clarity of the theoretical interpretation (adapted from Fichman 2001). Since it is expected that the drivers and inhibitors of Grid assimilation influence all assimilation stages in the same direction, this bias can be assumed to be of less importance in comparison to its potential benefits. Finally, we identified IT department size (Teo et al. 2003) and Grid expertise (years from first adoption) (Fichman 2001) as factors that can influence Grid assimilation and included them as controls.

4 RESEARCH DESIGN AND METHODOLOGY

4.1 Data Collection and Sample Profile

In order to validate the research model presented in Figure 1 and the associated hypotheses proposed in section 3, we conducted a quantitative field study. The study aimed at IT decision makers that work for a financial services provider in North America (U.S., Canada) with more than 1000 employees. Since the study focussed on determinants of Grid assimilation which also covers the post-adoption stage, only financial institutions already having implemented Grid technology were considered. Since the IT budget in the financial services industry is approximately twice as high as in other industries (Zhu et al. 2004), the Grid adoption rate is likely to be higher than in other industries. These facts make the financial services industry a valuable testing field for the research model. From an empirical perspective, focussing on a single industry also allows to control for extraneous industry factors that could otherwise confound the analysis, thereby enhancing internal validity (Zhu et al. 2004).

During the first two weeks of August 2009, the link to the online survey was administered via email to 2,078 North American participants of a financial services IT business-to-business panel by a large international market research company. Initially, we verified that all the participants of the involved panel satisfied our requirements (financial services industry, >1000 employees, IT decision maker). Subsequently, in a first wave, the market research company sent out electronic invitations to the panellists. After one week, an email reminder was sent out to non-respondents. The date of invitation, the date of participation, and the user ID were logged to ensure that each panellist only completed the online survey once. Finally, 480 responses from the survey were gathered, leading to a response rate
of 23.1 percent. The comparatively high response rate might be grounded to the fact that all participants completing the questionnaire received additional airline and hotel discount vouchers as incentive for their participation. Of the 480 complete responses, 214 were non-Grid adopter and 69 questionnaires exhibited missing values and were thus excluded. This leads to a final sample of 197 valid responses (187 from the U.S. and 10 from Canada).

4.2 Measurement Model Validation

Overall, the conceptual model encompasses seven reflective and two formative constructs (FS, ASSM) (see Table 1). All measures were informed by extant literature and were adapted to the specific context. Additionally, due to feedback from a panel of domain experts, some minor adjustments were made to the length of survey instruments and the wording of the items. To further validate the reflectively measured constructs (1) the construct reliability, (2) the convergent validity, and (3) the discriminant validity (3) were assessed. Construct reliability was tested by computing the composite reliability (CR) and average variance extracted (AVE) (see Table 1). All estimated values exceeded the proposed threshold of 0.7 for CR and 0.5 for AVE. In addition, Cronbach’s alpha was also computed and all coefficients were above the suggested lower boundary of 0.7. Second, convergent validity was assessed by considering the loadings, which were all highly significant at least at the 0.001 level and all above the proposed 0.707 threshold (Chin 1998). Finally, discriminant validity was evaluated by computing the intercorrelations between the latent variables. Consistent with the Fornell and Larcker (1981) criterion, the square root of the AVE of each of the different latent variables is higher than the correlations between constructs (see Table 2). Furthermore, a table of the cross-loadings of the different items emphasized, that the loading on the referring construct was higher than on all other constructs. As far as the formative FS and ASSM constructs are concerned, all weights except for the ASSM2 (which was insignificant) were above 0.2 and significant (Chin 1998). However, we chose to retain all three items of the ASSM construct for content validity reasons (Petter et al. 2007). Furthermore, the estimated variance inflation factors (VIF) for the ASSM items were all below 3.3 indicating no serious concern of multicollinearity (Diamantopoulos & Siguaw 2006). In essence, we found evidence that suggests a good reliability as well as good convergent validity and discriminant validity.

<table>
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<tr>
<th>Construct</th>
<th>Abbrev.</th>
<th>Mean</th>
<th>SD</th>
<th>Alpha</th>
<th>CR</th>
<th>AVE</th>
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<td>Grid Implementation Capability</td>
<td>GIC</td>
<td>2.9365</td>
<td>0.8150</td>
<td>0.7649</td>
<td>0.8488</td>
<td>0.5843</td>
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<tr>
<td>Grid Technology Integration</td>
<td>GTI</td>
<td>2.9365</td>
<td>0.8150</td>
<td>0.7274</td>
<td>0.8770</td>
<td>0.7813</td>
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<td>Grid Technology Competence</td>
<td>GTC</td>
<td>5.6616</td>
<td>1.1949</td>
<td>0.8798</td>
<td>0.9217</td>
<td>0.7970</td>
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<tr>
<td>Grid Implementation Mgt. Capability</td>
<td>GIMC</td>
<td>5.0812</td>
<td>1.1908</td>
<td>0.9123</td>
<td>0.9383</td>
<td>0.7921</td>
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<td>Mimetic Pressure</td>
<td>MP</td>
<td>4.6277</td>
<td>1.1616</td>
<td>0.9249</td>
<td>0.9523</td>
<td>0.8694</td>
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<tr>
<td>Coercive Pressure</td>
<td>CP</td>
<td>4.9289</td>
<td>1.2323</td>
<td>0.8163</td>
<td>0.8902</td>
<td>0.7299</td>
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<td>Normative Pressure</td>
<td>NP</td>
<td>4.6565</td>
<td>1.1616</td>
<td>0.9249</td>
<td>0.9523</td>
<td>0.8694</td>
</tr>
<tr>
<td>Firm Size</td>
<td>FS</td>
<td>2.9700</td>
<td>2.9700</td>
<td>n/a</td>
<td>n/a</td>
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<td>Assimilation</td>
<td>ASSM</td>
<td>4.5245</td>
<td>1.7808</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Table 1: Descriptive Statistics and Reliabilities; n/a: FS 1-item formative measure, ASSM 3-item formative measure, reliability analysis only applicable for reflective measures
Since all self-reported data can potentially be affected by common method bias arising from different sources such as social desirability and consistency motif (Podsakoff et al. 2003), we conducted an additional common method bias analysis (Liang et al. 2007, Podsakoff et al. 2003). First, we computed a Harman’s one-factor test, revealing that the most variance explained by one factor is 28.09 percent. Thus, the presence of common method bias is not likely in our study. Despite this, we included a common method factor in my PLS model whose indicators included all the principal constructs’ indicators and calculated each indicator’s variances substantively explained by the principal construct and by the method. The results show that the average substantively explained variance of the indicators is 0.68, while the average method variance is 0.033 resulting in a ratio of about 21:1. In addition, most method factor loadings are not significant. Based on both of these results, we concluded that there is unlikely to be a serious concern of common method bias for this study.

### 4.3 Hypotheses Testing and Discussion

The research model was operationalized as a structural equation model (SEM) and analyzed using the Partial Least Squares (PLS) approach (Chin 1998) with the software implementation SmartPLS (Version 2.0 M3). Due to the explanatory approach, the measurement model of both formative and reflective constructs with mixed scales (Chin 1998), and the data set of 197 responses, we deemed a components-based approach instead of covariance-based approach as appropriate for the complexity and design of my research model. Figure 1 depicts the estimates obtained from PLS analysis. The $R^2$ value of .366 indicates that the model explains a moderate amount of variance for Grid assimilation (Chin 1998). The results provide first evidence that six of the eight (GIC, GTI, GIMC, FS, MP, NP) TOE factors have a significant impact ($p<.05$) on Grid assimilation. While firm size has a negative path towards Grid assimilation, the other five factors exhibit positive paths. Only the paths associated with GTC and CP are insignificant ($p>.10$). Therefore, all hypotheses except for hypotheses 3 and hypotheses 7 are supported. Concerning the controls, only Grid expertise operationalized as years from first Grid adoption exhibited a significant (positive) path towards Grid assimilation which is consistent with literature (Fichman 2001).

As far as the role of institutional pressure is concerned, our results suggest that there is a substantial positive impact of mimetic and normative pressure on Grid assimilation. In detail, mimetic behaviour such as bandwagon phenomena and professionalization tendencies are very present in the process of Grid assimilation in the financial services industry. The significant impact of mimetic pressure indicates technological uncertainty or ambiguity in the financial services industry leading to the facilitation of mimicry among competitors. However, since the Grid-induced business value
generation momentum was not considered in this study no further evidence can be provided if mimicry eventually leads to an increase or decrease of potential business value generation. But despite this, mimetic pressure is existent in the financial services industry and thus has to be carefully considered in future studies. As far as the professionalization tendencies in the financial industry are concerned, service-oriented Grid assimilation can be assumed to be a strategic action towards arising institutional pressure. Vendors and customers increasingly demand more sophisticated financial products and investment strategies, thus requiring improved data mining and data processing capabilities as provided by service-oriented Grids. Surprisingly, we could not find a significant path leading from coercive pressure towards Grid assimilation as hypothesized before. This is especially astonishing since the financial services industry is exposed to a very high level of regulation and thus direct governmental impact. However, this could indicate that there is a mediating agency (e.g., top management) involved in the causal relationship between coercive pressure and (Grid) assimilation (Liang et al. 2007) facilitating the sensemaking of Grid systems in terms of regulatory compliance. Buhl et al. (2009) in this context even state that higher market volatility not necessarily increases the demand in Grid-based computing power for risk management. Still, the result of our study is consistent with regard to the insignificant weight of the ASSM2 (risk management process) item, possibly indicating that Grid computing is not associated with risk management and regulatory compliance so far. Surprisingly, GTC was not found to significantly impact on Grid assimilation, which is counterintuitive. This might be grounded in the fact that virtualized Grid infrastructures are a rather smooth evolution of well-established concepts such as cluster computing and service-oriented architectures, not exhibiting high visibility towards end users and thus not necessarily requiring idiosyncratic technical competences. Interestingly, our results suggest that especially the conceptualized complementarity (GIC, GTI, GIMC) in the organizational readiness is decisively determining the Grid assimilation process. Among these factors, especially GIMC which integrates the depicted complementarity with regard to the operational management of both technical and business capabilities exhibits the strongest impact towards Grid assimilation, which is consistent with theoretical concepts as boundary spanning. Our findings emphasize that smaller financial services providers are more likely to be open-minded towards technological innovation as service-oriented Grids. This is reasonable due to the fact that smaller firms are exposed to a lower risk of reputation losses rooted in ill-conceived technological innovation due to a lower level of public attention and are generally more flexible towards innovation. Finally, our insights suggest that service-oriented Grids are utilized for the new product development and asset management process so far.

5 CONCLUSIONS AND LIMITATIONS

The theoretical contribution of the article is twofold: First, it contributes to the diffusion of innovations theory by validating the role of institutional pressure impacting on IT assimilation in the context of the holistic TOE framework. In detail, the results of our field study suggest that mimetic and normative pressure significantly drive the process of Grid assimilation whereas a significant link between coercive pressure and Grid assimilation could not be found. Thus, professionalization tendencies and mimetic behaviour foster Grid assimilation. The insignificant link between coercive pressure and Grid assimilation is astonishing since especially the financial services industry is exposed to a very high level of coercive pressure rooted in the intense regulation. However, the results might indicate that so far the relatively new Grid technology is not perceived as means to satisfy regulatory demand. Second, especially the complementarity between business (i.e., Grid implementation management capability) and technologically-related (i.e., Grid infrastructure capability and Grid technology integration) determinants are identified as important drivers of Grid assimilation in the financial services industry for the first time. For practitioners, the research provides a first means of assessing the success and hindering factors of Grid assimilation and offers remaining potential of exploitation by further Grid assimilation, e.g., an improved risk management and regulatory compliance. Still, the depicted work is limited with regard to the specific technology, industry, and cross-sectional approach, thus restricting the generalizability of the supported hypotheses. Moreover, the hypothesized and theoretically
grounded impact of coercive pressure towards Grid assimilation could not be supported by our empirical analyses, thus requiring additional analyses on the role of a potentially involved agency, e.g., top management, on the link between institutional forces and Grid assimilation. Moreover, it would be interesting to take a closer look on organizational capabilities (e.g., organizational mindfulness) mitigating the impact of mimetic pressure towards Grid assimilation, potentially contributing to an increased generation of business value. This could be especially valuable in a highly turbulent and uncertain environment as in the current financial crisis. Finally, especially for practitioners, the business value generation momentum of Grid assimilation could be assessed in a subsequent study.

References


