Abstract

In recent years, Grid computing has gained considerable attention in industry leading to the vision of a new agile business platform which provides the on-demand access to IT resources. In this article, we refer to the current trend of financial services providers to utilize Services Grids in order to increase the level of business agility in terms of improved environmental sensing and responding capabilities. These capabilities especially address environmental turbulence as a major source of uncertainty and unpredictability. Deductively drawing from the extant literature and informed by the insights of a conducted case study within a large bank, we develop a conceptual model and propositions depicting the interaction between Services Grid competence as driver of business agility. In this context business agility can be assumed to be an antecedent of improved financial firm performance, especially against the background of environmental turbulence.

1. Introduction

During the last couple of years, Grid computing has evolved into a well-understood technology that provides users and applications access to a large pool of heterogeneous information technology (IT) resources, such as supercomputers, storage systems, databases, and services, which can be accessed as a unified resource. Following the well-established definition provided by Foster [6], a Grid is a system that coordinates IT resources that are not subject to centralized control, uses standards, open protocols and interfaces, and delivers nontrivial qualities of service. Regardless of their operating characteristics, Grid computing enables heterogeneous and geographically dispersed IT resources to be virtually shared and accessed on-demand across an enterprise, industry, or workgroup.

These capabilities result in a faster IT-based response towards environmental turbulence with regard to changing market and technological preferences, thereby contributing to an increased level of organizational business agility. Consistent with the extant literature, business agility encompasses the ability of a firm to sense and respond to environmental changes in an efficient, timely and effective manner [4, 18]. Despite several calls to identify the role and drivers of IT-based business agility with respect to environmental turbulence and its final impact on financial firm performance [14, 18], little research has been conducted in this field. Thus, our central research questions are:

How does Services Grid competence contribute to the level of business agility as important prerequisite to increase a firm’s financial performance?

How is the impact of business agility on a firm’s financial performance affected by environmental turbulence?

Grounded in the extant literature and informed by the insights of a case study conducted in a large German bank, we propose a conceptual model and propositions depicting the nomological linkage between Services Grid competence and business agility. Especially against the background of varying levels of environmental turbulence, business agility might contribute towards an increased financial firm performance.

The remainder of the paper is organized as follows: First, the theoretical background of business agility, environmental turbulence, and the application of Services Grids in the financial services industry is tightly depicted with regard to the required domain knowledge of our conceptual model. Next, the employed research design and methodology of the conceptual framing is introduced. As part of this, the methodology of the conceptualization process and the key facts of the conducted exploratory case study are presented. Consistent with the extant literature, the
insights from the case emphasize Services Grids as scalable, powerful, and service-oriented business architectures which exhibit the potential to increase the level of business agility of a firm. Based on this, in the subsequent section we elaborate in detail on our deductively derived conceptual model depicting the impact of Services Grid competence on the level of business agility as antecedent of financial firm performance. In addition, we especially assess the moderating role of environmental turbulence in interacting with IT-based business agility. Therefore, we depict the theoretical foundations for each of the derived constructs and present first support for the depicted propositions from our conducted case study, where applicable. The article concludes with a summary of our findings, elaborates on its limitations, and provides an overview of the ongoing process of further empirical validation.

2. Theoretical Background

2.1. Business Agility

The extant literature depicts several competing definitions of business agility, mostly grounded in the manufacturing domain, e.g., Tsourveloudis and Valavanis [22] elaborate on the term of agility as the ability of an enterprise to operate profitably in a rapidly changing and continuously fragmenting global market environment by producing high-quality, high-performance, customer-configured goods and services. Beyond the manufacturing domain, business agility is often defined as the ability of an organization to sense environmental change and respond to this change in an efficient, effective and timely manner [4].

Basically, three different kinds of agility can be distinguished forming the overall agility conceptualization [18]: operational agility, customer agility, and partnering agility (see Figure 1). Operational agility is defined by the competence of a firm to dynamically rearrange and reconfigure its embedded business processes in order to exploit upcoming opportunities for innovation and competitive action. On the other hand, customer agility encompasses the ability of a firm to co-opt with customers by leveraging their voices in order to sense market opportunities. Finally, partnering agility reflects the ability to leverage the tacit knowledge and capabilities of supplier and partner networks for gaining and sustaining competitive advantage. Since operational agility initially enables a firm to co-opt within and beyond its borders, it facilitates the development of customer and partnering agility.

![Figure 1. Business Agility](image)

In this article and consistent with the extant literature [4, 14], we focus on the ability of sensing environmental changes and responding to them as the two main dimensions of business agility.

In a broader sense, IT can be seen as a digital options generator eventually leading to competitive actions as antecedent of increased financial firm performance [18]. This link is mediated by the firms’ ability of entrepreneurial alertness which encompasses the capability of a firm to oversee the surrounding market in order to spot and take advantage of evolving opportunities. Despite several calls [14, 18], little research [e.g., 22] has been conducted on a measurement of business agility rooted in IT assimilation.

2.2. Environmental Turbulence

The concept of environmental turbulence encompasses environmental conditions of uncertainty and unpredictability due to massive and rapid changes in technological development and market preferences [11]. These can be either caused by market turbulences or technological turbulence [10]. Market turbulence is caused by unpredictability in market demands, consumer needs and competitor strategies or a changed rapidity of market demands with regard to the frequency of change in the environment. On the other hand, technological turbulence encompasses the unpredictability of new technological innovations in terms of their unanticipated consequences for an industry and their diffusion rapidity [10]. Due to a categorization by Ansoff and Sullivan [2] environmental turbulence can be further characterized by four factors:

1) Complexity of events (in the environment)
2) Familiarity of the successive events
3) Rapidity as time span between first occurrence and further evolution
4) Visibility/Unpredictability of the consequences of these events
Based on this characterization five different hierarchical levels of environmental turbulence can be distinguished (see Table 1).

Table 1: Hierarchical Levels of Environmental Turbulence [2]

<table>
<thead>
<tr>
<th>Turbulence Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>National Economic</td>
<td>Regional Technological</td>
<td>+</td>
<td>Regional Technological</td>
<td>Global Socio-Political</td>
</tr>
<tr>
<td>Familiarity of Events</td>
<td>Familiar</td>
<td>Environments</td>
<td>Discontinuous Familiar</td>
<td>Discontinuous Familiar</td>
<td>Discontinuous Novel</td>
</tr>
<tr>
<td>Rapidity of Change</td>
<td>Slower Than Response</td>
<td>Comparable to Response</td>
<td>Faster Than Response</td>
<td>Much Faster Than Response</td>
<td></td>
</tr>
<tr>
<td>Visibility of Future</td>
<td>Recurring</td>
<td>Forecastable</td>
<td>Predicable</td>
<td>Partially Predictable</td>
<td>Unpredictable Surprises</td>
</tr>
</tbody>
</table>

An environmental turbulence level of 1 reflects a surrounding with slow changes, a limited sphere, high familiarity of occurring events, and gradual long term responses of affected firms. On the other hand, an environmental turbulence level of 5 is defined by an environment of discontinuous and unpredictable surprises of global socio-political scope which challenge or overwhelm even well-managed firms, since they fail to respond timely to their initial occurrences.

The consequences of environmental turbulence demand for organizational sensemaking patterns in order to safeguard organizational outcome performance [13]. In this context, firms can be seen as sensemaking units stimulated by environmental turbulence constantly challenged to identify the contextually appropriate strategic response.

2.3. Services Grids in the Financial Services Industry

In the emergence of Grid computing there has been the vision of a global open Grid as source of standardized access to heterogeneous IT resources. However, over the years it turned out that specialized departmental or enterprise Grids seem to prevail in industry due to the increased level of control over the utilized data and resources. Enterprises build-up their own Grid infrastructures by transforming their formerly vertically integrated IT infrastructures, each responsible only for a distinct enterprise function or application, to horizontally integrated, service-oriented architectures (SOA) built on a set of loosely coupled software services [20].

Grid infrastructures in general can be characterized by a set of latent properties that extend those of traditional compute clusters. These properties provide a variety of benefits [1] that include:
- On-demand provisioning of geographically dispersed, heterogeneous resources
- Seamless computing power achieved by exploiting under-utilized resources to solve compute-intensive problems in a decreased processing time
- A reliable, resilient, and highly available infrastructure with autonomic management capabilities and on-demand aggregation of resources from multiple sites to meet unforeseen demand
- A faster access to distributed data

A promising type of Grids that is supposed to further promote the adoption of Grid technology in a business environment is the Services Grid [24]. A Services Grid defines a distributed computing environment for business applications grounded on the SOA paradigm, which delivers scalable encapsulated software and business services. Services Grids provide a flexible association of IT resource requirements to (dispersed) physical resources, allowing workloads to change their profile over their usage lifecycle due to changing demand. Due to the service-oriented architecture, Services Grids implement the idea of utility computing that is envisioned to be the next generation of IT evolution [16] by providing computational resources and services on a use-on-demand basis.

Especially, Services Grids enable firms to sense and respond to environmental turbulence in an agile manner, thus mitigating arising potential negative impact:

First, due to the increased computing power and the decreased processing times, novel complex strategic forecasting applications become feasible for firms. These enable firms to close the time gap between the initial occurrence of an event and the referring response of the firm (Rapidity of Change), to improve the precision of forecasts, e.g., the assessment of complex models (Visibility of Future) and to deal with Complexity. Second, improved data mining capabilities in terms of a faster and more detailed data access even reinforce the mentioned mitigating impact on Rapidity of Change, Visibility of Future and Complexity and facilitate firms to identify changes in the market and derive reasonable strategic (counter-) actions. Finally, the on-demand capability of Services Grids grounded in the SOA paradigm enables firms to rapidly rearrange existing business processes and to flexibly shift between internal and external IT resource consumption depending on the prevailing requirements (Rapidity of Change).

Among the different industries, the financial services industry with its information-driven business...
processes and its high computational demands is one of the most promising application domains of Services Grids [8]. The current financial crisis lead to high regulatory pressure to utilize an efficient risk management which can be supported by a “gridification” of the existing risk management applications [23].

Until today, little research has been conducted to analyze the challenges and benefits of Services Grids in the financial services industry. Therefore, we deductively derived a conceptual model informed by the insights of a case study in a large German bank that has developed and adopted a Services Grid for risk management.

3. Research Design and Methodology

3.1. Conceptual Research Design and Methodology

In order to theoretically ground the depicted article from a methodological point of view, we choose a conceptual article framing as discussed by Hirschheim [9] drawing from Toulmin [21]. Therefore, we explicitly addressed the three mentioned mandatory components for a conceptual article: In order to disclose the often implicit claims in terms of statements the authors are asking the reader to accept as true, we explicitly stated the research questions and deductively derived propositions. To support or ground the stated claims (grounds), we referred to two distinct sources of evidence: non-empirical and first empirical support. First, we based our conceptual model on well-established literature streams on business agility and environmental turbulence, finally bringing together both in one deductively derived conceptual model. Second, we conducted an exploratory case study, finding first support for the motivated propositions. In order to link the gathered data to the stated claims from a point of causality (warrants), we grounded each adapted nomological relationship (e.g., the moderating impact of environmental turbulence) in additional evidence from extant literature. Moreover, we addressed the propositions in our semi-structured interview questionnaire to ensure overall coherence. To safeguard both theoretical and practical relevance, we tailored the depicted conceptual model along existing literature gaps and the expressed needs of our interview partners from the large bank.

3.2. Exploratory Case Study: Application of a Services Grid for Risk Management

In order to analyze the Grid solution of the bank from an economic perspective, we used an embedded, single-case study design according to Yin [25]. In October 2007, we were able to apply our exploratory research by conducting semi-structured in-depth interviews with the leaders of the IT and business department responsible for the Grid application development and implementation. In sum, interviews were conducted with the responsible IT project manager, the involved strategic IT manager from the business department, and the chief systems architect of the project. Each of the interviews lasted about one and a half hours and was conducted on the same day for better comparability. All interviews were recorded, fully transcribed, and finally validated by the interviewees to ensure the accuracy of their responses and to eliminate erroneous inferences. Since the objective of the case study was to further inform the deductively derived conceptual model, we focused on the mentioned key employees with regard to the Grid project. In our case and due to the central position of our interview partners, we could get first informing insights after the depicted round of interviews. In addition to this primary data, we collected and analyzed secondary data for triangulation purposes, e.g. the project documentation, the system architecture and current Grid utilization figures.

In the beginning of 2006, the business department of the bank responsible for the market price risk controlling requested a stable and reliable IT infrastructure that accelerates the compute-intensive risk calculations in order to reduce time-to-market of new financial products and to calculate key risk figures promptly. Since the calculation of market price risks can be subdivided to concurrent computing tasks, the development team decided to establish a Services Grid infrastructure by consolidating the already existing hardware resources (storage, databases, servers, etc.). Furthermore, the development team aimed at building a distributed and scalable architecture that enables an easy integration of new encapsulated services without the need to change the interfaces. Since January 2007, the Services Grid is being used successfully for calculating market price risks during nighttime.

A few months later, the stock trading department of the bank requested a faster solution in order to speed up the risk calculations for their stock portfolios during the day. Therefore, the development team integrated the trading application into the existing Services Grid and thereby obtained a significant reduction in computing time without purchasing additional hardware resources, e.g., the time-to-market could be
reduced to one fourth of the original time. Furthermore, intra-day calculations of risk figures for portfolios have been made feasible by integrating the stock trading application into the Services Grid. By using the Grid resources, the risk calculations could be accelerated from about 3.5 hours to 7 minutes. This provided another huge potential for the investment bankers of the bank to sense market opportunities and risks and to respond to them appropriately due to an improved information base.


The insights of the depicted case study emphasize the high potential of Services Grids to increase the sensing and responding capabilities of a financial services institution by providing an agile business platform. The Grid-based acceleration of business applications eventually leads to shorter response times to a changing market environment and thus increases the level of business agility. Grounded in the business agility framework proposed by Sambamurthy et al. [18] and informed by our case study results, we develop a conceptual model that analyzes the impact of Services Grid competence on the level of business agility. Moreover, we focus on the interaction between environmental turbulence and business agility, which has not been done to our knowledge so far.

Consistent with the extant literature, Services Grids can be seen as an IT-based means of digital options generation leading to an increased level of business agility and facilitating the emergence of competitive actions (see Figure 2) [18]. Since competitive actions are direct antecedents of financial performance, the adoption of Services Grids will positively impact the overall financial firm performance. Finally, arising environmental turbulence especially challenges a firm to sense and adequately respond to arising environmental changes in order to eventually safeguard financial performance. In the following, the single constructs of our research model are depicted in further detail by providing their theoretical foundations. Based on this, deductively derived propositions will be introduced and their consistency with the insights of our case study will be evaluated (see Table 2 for an overview).

4.1. Services Grid Competence

The case study revealed that it is vital to a firm to develop a high level of Services Grid competence in order to assimilate a Services Grid successfully. Drawing from other conceptualizations of IT capability [28], Services Grid competence is formed by the level of financial investments, the maturity of the existing Services Grid infrastructure (e.g., access to a high speed, low latency network) as well as the technical and managerial competence of the involved IT staff. Additionally, Services Grid competence captures the ability of a firm to drive Grid-based innovations of strategic importance in an effective and efficient manner [based on 18]. In our case study, it turned out that the IT staff responsible for the development of the Services Grid solution exhibited deep expertise in the field of Grid technology and collaborated intensively with the two involved business departments to ensure the IT business alignment of the solution. Finally, new investments for the Grid infrastructure have been moderate, since most of the hardware resources of the newly found Grid already existed leading to an overall moderate to high Services Grid competence in the analyzed case.

In general, Services Grids allow the on-demand composition of complex services based on underlying commodity services and thus evolve the ability of an enterprise to react to changing market requirements or customer needs in a flexible manner [12, 15]. This is rooted in the characteristics of software services which are loosely coupled while their business functionality is being fully encapsulated (see 4.2 for a detailed discussion). Thus, we propose:

**P1:** Services Grids competence positively affects the generation of digital options.

4.2. Digital Options

Digital options represent a set of IT-enabled capabilities that are reflected in digitized business
processes and knowledge systems and can be further subdivided with respect to their level of reach and richness [18].

A high degree of process reach is represented by the design and establishment of both inter-departmental and inter-organizational digitized processes, leading to an improved cooperation with customers and/or business partners. Digitized process richness covers the quality, transparency, and availability of information about transactions running within a process or between two processes and the ability to re-engineer the underlying processes upon this. The level of access to codified firm knowledge and its degree of comprehensiveness is encompassed by digitized knowledge reach. Digitized knowledge richness facilitates the exchange and development of knowledge within a company. Services Grid competence in general can contribute to the generation of digital options in a threefold way (see Figure 3). As elaborated in section 2.3 Services Grids provide increased computing, data mining and on-demand configuration capabilities. Due to the increased computing capability more complex data can be processed and timely provided, thus positively impacting on the process and knowledge richness. The increased data mining capability leads to a faster and more detailed access to and new combination of existing codified and dispersed knowledge, thus increasing the knowledge reach and richness. Finally, the on-demand configuration capability due to the grounding SOA paradigm enables firms to rearrange business processes and provide information centrally to other applications or processes, thus positively affecting the process reach and knowledge richness.

![Figure 3: Services Grid Competence as Driver of Digital Options Generation](image)

Regarding the digital options generation in the depicted case, the degree of process reach was moderate, since the Grid infrastructure is currently solely used by two major business departments within the bank. The two financial applications of the bank currently running on the Services Grid conform to specified interfaces and implement the SOA paradigm, thus allowing for further integration and improved process reach. The availability of detailed and complex risk figures leads to a relative high level of process and knowledge richness.

As the project manager stated it:

“[…] It is not sufficient, that the trading department is able to deal with the [risk of the financial] product. Instead it has to be introduced to all other involved business departments within the bank. They all have to deal with the product […] they all have to comply with their respective requirements. […] And in this sense, it was necessary to provide such a [Grid-based] risk component as a central service via standardized interfaces within the system landscape, in order to meet all [the two business departments] requiring it without having to change the whole system landscape and without requiring changes in ten different systems. If you do that, then there is nothing left of this time-to-market idea.”

Finally, the current knowledge reach of the bank’s Services Grid is rather low, since the “gridified” financial applications are distinct and no data mining capability is employed yet. Nevertheless, it will be possible in the future to decompose the single applications into a set of dedicated software services in order to provide homogenous services to different applications. For example, services that provide results of risk simulations or historical data could be capsulated and obtained by different financial applications requiring this information.

Overall, we found a moderate to high level of digital options generation in the depicted case, providing first support for P1.

In order to increase the level of business agility, certain sensing and responding capabilities [14] have to be developed by the means of a composition of organizational structure, technological options, people and innovation which are so-called agility providers [27]. These agility providers have to be fully integrated with the support of information systems and technology, thus facilitating business agility. Hence, we propose:

P2: Digital options positively influence the level of business agility.

4.3. Business Agility

The business agility construct draws from the business agility measurement framework proposed by Overby et al. [14]. As depicted by Figure 4, the framework encompasses a two-dimensional measure...
with the sensing capability on the abscissa and the responding capability on the ordinate. Each of the four quadrants represents a distinct profile of a firm in terms of its capability to sense environmental changes and to respond to them appropriately.

<table>
<thead>
<tr>
<th>Sensing Capability</th>
<th>Responding Capability</th>
</tr>
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<tbody>
<tr>
<td>Quadrant III:</td>
<td>Low sensing capability / High responding capability</td>
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<tr>
<td>Quadrant I:</td>
<td>High sensing capability / High responding capability</td>
</tr>
<tr>
<td>Quadrant IV:</td>
<td>Low sensing capability / Low responding capability</td>
</tr>
<tr>
<td>Quadrant II:</td>
<td>High sensing capability / Low responding capability</td>
</tr>
</tbody>
</table>

**Figure 4: Business Agility Measurement Framework**

The sensing capability refers to the ability of firms to immediately sense different types of environmental changes (see Figure 4: quadrant I, quadrant II) including (based on Zhang and Sharifi [27]):

- social, legal, and regulatory changes
- changes in customer needs and preferences
- changes in technology
- changes in the competitive environment
- changes in the business network

The responding capability of the business agility framework refers to the ability of firms to respond to environmental changes in an effective and fast manner (see Figure 3: quadrant I, quadrant III). The organizational assimilation of a Services Grid is a means to respond to a rapidly changing business environment, since Services Grids reduce the time-to-market of emerging business models. In general, sensing and responding capabilities rooted in the IT infrastructure are being facilitated by a high level of interoperability and networking [22] as it is exhibited by Services Grids. A high level of interoperability provides a company with the ability to exchange and store information in a distributed and dispersed environment. The networking capability reflects the level of communication skills of a company and is determined by the degree of connectivity of the enclosed entities and organizational levels. Finally, if a Services Grid not only lacks the provision of sensing capabilities but also the provision of responding capabilities, it is represented by quadrant IV.

In general, retrieving and spreading information within and across an organization contributes directly to the sensing and responding capabilities leading to an overall increased level of business agility. Since the Services Grid of the analyzed bank is based on a defined service-oriented architecture, it provides a scalable, flexible, and powerful business platform that facilitates the fast integration and deployment of new business processes. Furthermore, the capability to dynamically allocate IT resources enables the bank to shift resources to areas of need which will help them to embark on new ventures. As the project manager commented in this case:

“But for sure there is a movement [concerning Grid-based systems] in the market. Also, if you look at the literature which is out there and have a look at other investment banks. Parts of them are having a Grid with 10000 CPUs and thus are in a totally different [competitive] position, e.g. Goldman Sachs. And of course, due to the fact that this is technological feasible, in this environment, we are talking about [financial] products that exhibit and require such a complexity.”

The objective of the bank investigated in the case study is to evolve a high sensing capability and a high responding capability and thus represents the profile of quadrant I depicted in Figure 4. Currently, the bank is reflected by quadrant III, since the Services Grid exhibits only moderate support of sensing environmental changes. Despite the sensing of emerging market price risks, there are currently no services deployed on the Services Grid that are capable of sensing changes in customer needs and market changes. Although the Services Grid is currently not able to sense customer-related environmental changes, these changes have to be sensed by the bank nonetheless. Currently, this is done by other applications that are running on dedicated servers and computer clusters that are not integrated into the Grid environment so far. Despite the moderate sensing capability, the Services Grid exhibits a high responding capability due to its SOA-compliant implementation. New services can be integrated into the Grid in a fast and efficient manner, leading to the capability of staying competitive in the dynamic financial services market, thus overall providing first support for P2.

Against the background of the worldwide financial crisis, environmental conditions become increasingly turbulent for many industries, thus resulting in a rising need for business agility in order to act successfully in the market. Ongoing with an increased level of business agility the number of action alternatives grows, since enterprises become more independent from infrastructural restrictions. Furthermore, Services Grids facilitate the emergence of new and the transformation of existing business models [15]. Therefore, we claim that financial services providers must exhibit a high sensing capability in order to meet the legal and regulatory requirements and in order to stay competitive in the dynamic financial market.
Thus, we propose:

P3: The level of agility positively affects competitive actions.

4.4. Competitive Actions

Competitive actions are market-oriented actions of a firm in order to change the status quo of the addressed market or segment [18]. These can be either achieved by the introduction of a new product, a new distribution channel or the establishment of a new market segment (number of competitive actions). Moreover, the variety and richness of the competitive actions may increase, thus leading to a more complex action repertoire. The impact of the Services Grid assimilation on the number of available competitive actions in the analyzed bank is twofold: The “gridified” risk management application leads to a more precise assessment of existing and emerging market price risks thus facilitating a better pricing of financial products. Additionally, the “gridification” of the two financial applications lead to a significantly decreased processing time and thus a shorter time-to-market of new financial products, which provides first support for P3. In this context the chief systems architect emphasized:

“Of course, the [improved] time-to-market [of new financial products] is a competitive advantage. [...] the whole topic of service integration is an even more important dimension. [...] This is based on the whole [service-oriented] architecture and interface landscape which facilitates the integrations of it [the assessment of risk] in a different system without changing different systems.”

In general, Ferrier et al. [5] propose that a more complex action repertoire reflected by a broad range of innovations leads to a longer lasting window of opportunity until market competitors adapt to that situation. Finally, Young et al. [26] show first evidence that the number of competitive actions is positively correlated to financial firm performance. Thus, we propose:

P4: Competitive actions positively affect the financial performance.

Unfortunately, due to information restrictions of the analyzed bank, we were unable to gather data on the financial firm performance. Therefore, we could not assess P4 as part of our case study.

4.5. Environmental Turbulence

The extant literature states several reasons for the rising importance of organizational responsiveness:

Technological breakthroughs, the ongoing deregulation of markets and globalization have intensified competition and increased the level of environmental turbulence leading to the emergence of new responsive organizational forms. Ansoff and Sullivan [2] identified a trend towards environment driven firms succeeding the formerly production driven and market driven firms. Environment driven firms exhibit an emphasis on the continually monitoring of environment signals in order to identify appropriate strategies.

Since business agility reflects the organizational capability of sensing and responding to arising environmental changes in a timely and adequate manner, it helps to overcome or even benefit from environmental turbulence. Especially successful firms exhibit the capability to anticipate and address environmental turbulence through strategic planning (e.g., the selection of competitive action repertoire). Moreover, agile firms are in a better condition to cope with environmental turbulence, reinforcing the causal relationship between strategic planning and organizational performance [17]. In the case of the large German bank the IS executives of the depicted bank stated that the main objective of the implemented Services Grid-based solution was to identify and quantify emerging risks more timely (sensing capability) and to decrease the time-to-market of new financial products (responding capability). Due to the more precise assessment of market and price risks, a more sophisticated pricing of financial products and new products could be implemented (competitive actions).

This was especially important to the involved management against the background of highly dynamic and volatile international financial markets (environmental turbulence). Consistently, Souchon et al. [19] provided first evidence for the moderating role of environmental turbulence on the nomological relationship between responsiveness and organizational performance. In their conducted field study responsiveness was found to be positively related to organizational performance. This link at this juncture was positively moderated by environmental turbulence, such that a high level of environmental turbulence lead to increased organizational performance due to a high level of responsiveness. Consistent with literature, the link between organizational responsiveness and market orientation and organizational performance can be assumed of being unstable across different levels of environmental turbulence [7]. Thus, we propose:

P5a: The generation of competitive actions is positively moderated by a high degree of environmental turbulence.
P5b: The generation of financial firm performance is positively moderated by a high degree of environmental turbulence.

In general, 2007 could be considered as a rather calm year for the financial services industry compared to the current situation at the international financial markets. Assumed as first indicator of environmental turbulence, the one-year historical volatility of the German Stock Index (DAX30) exhibited an approximately half as low historical volatility in 2007 compared to 2008. Thus, we could not seriously assess the moderating effect of environmental turbulence on the generation of financial firm performance (P5b) in 2007. In case of P5a, we valued the intended strong alignment of a Grid-based risk management application to the dynamical and volatile financial markets as first support.

Table 2. Overview propositions

<table>
<thead>
<tr>
<th>Proposition</th>
<th>Support</th>
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<tbody>
<tr>
<td>P1: Services Grids competence positively affects the generation of digital options.</td>
<td></td>
</tr>
<tr>
<td>P2: Digital options positively influence the level of business agility.</td>
<td></td>
</tr>
<tr>
<td>P3: The level of agility positively affects competitive actions.</td>
<td></td>
</tr>
<tr>
<td>P4: Competitive actions positively affect the financial performance.</td>
<td></td>
</tr>
<tr>
<td>P5a: The generation of competitive actions is positively affected by a high degree of environmental turbulence.</td>
<td></td>
</tr>
<tr>
<td>P5b: The generation of financial firm performance is positively affected by a high degree of environmental turbulence.</td>
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5. Conclusion and Further Research

In this paper, we derived a conceptual model conceptualizing the impact of Services Grid competence on the level of business agility in terms of a faster sensing of and responding to environmental turbulence. The depicted model especially emphasizes on Services Grid-based business agility which potentially mitigates negative consequences of environmental turbulence, eventually leading to increased financial performance. In this context, we elaborate on the interrelationships between Services Grid competence and the generation of digital options on an operational domain level.

Following a conceptual article design as proposed by Hirschheim [9], the model is grounded in the extant literature (non-empirical support) and is informed by the insights of a conducted exploratory case study in a large German bank (empirical support). In the depicted case the bank had introduced a Services Grid for risk management leading to an improved assessment of emerging risks and a significant reduction in time-to-market of new financial products. The insights from the exploratory case study provide first support for the derived model propositions in most cases.

The conceptualized causal relationship between Services Grid competence and financial firm performance against the background of market and technological turbulence contributes to a deeper understanding of the impact of IS assimilation on IT business value generation. For managers in the financial services industry the model provides an assessment of the impact of Services Grids assimilation and their special appropriateness in a highly turbulent industry as the financial services industry.

Since the current model reflects the abstract conceptualization of the overall causal relationships, in a next step all the distinct sub-constructs and their interrelationships could be operationalized on the technological domain level. Regarding this, as a first step this article elaborated on the impact of Services Grid competence towards the generation of digital options. In a next step, this work could be extended to the operationalization of the interrelationship between digital options and the distinct dimensions of business agility. In order to empirically validate the model, it is intended to conduct a quantitative field study. Since the validity of proposition 4 and proposition 5b could not be assessed as part of our case study, in a subsequent field study these propositions could be re-validated based on objective (longitudinal) secondary data, as depicted by Dos Santos et al. [3] and by operationalizing environmental turbulence as depicted in [11].

However, due to the assessed specific technology and industry, further case or field studies in the financial services industry and other industries will be required to empirically validate and generalize the depicted conceptual model with regard to IT.

6. References


