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# The role of alignment for strategic information systems: extending the resource-based perspective of IT

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## ABSTRACT

The importance of strategic information systems (SIS) in the financial industry is documented in many studies. But still there is a virulent lack of frameworks to explain the profit impact of IT in general and to guide firms in exploiting the IT resource as a source of competitive advantage.

By incorporating findings from the resource based view (RBV) and strategic alignment literature we elaborate key concepts potentially leading to a sustained competitive advantage (SCA). Supported by four case studies from the financial services industry, our findings suggest that the exploitation of SIS for achieving SCA requires IT business alignment based on organizational routines of cross-departmental interaction. These concepts are explicitly modeled and integrated into a formal model using microeconomic theory. Especially interactions between the IT and business domain are found to be a key success driver.

## Keywords

Alignment, competitive advantage, resource-based view, production function.

## INTRODUCTION

How to use IT to improve a firm's competitive position is a fundamental question in IS research. From the rich literature on the resource based view (RBV) of IT we know that it is not IT systems as such yielding utility but rather the way these are used and developed within a business context. While on an abstract level findings of the RBV are very instructive, the concrete managerial implications for daily business, organizational structures within a firm, and especially the relationship between IT and business units are far less clear. This is specifically due to the somewhat underdeveloped concept of complementarity between IT and business resources (Wade and Hulland, 2004).

From the alignment literature it is known that alignment processes are necessary to strategically exploit IT (Henderson and Venkatraman, 1993). Empirical studies confirm a positive impact of these processes on performance (Keen, 1991; Kearns and Lederer, 2003). Thus, the objective of this research is to elaborate on the complementarity between IT and business resources using RBV and alignment arguments in order to explain the profit impact of IT. Therefore, the main research questions are:

- How does IT business alignment impact process performance?
- What are the effects of organizational routines on the performance of a business process?

Following this objective, derived from the literature on the resource-based view and IT business alignment first a conceptual framework of IT value creation is developed focusing on the identification of the underlying mechanisms of value creation. The first research question is then addressed by four case studies exploring how IT business alignment impacts process performance in the financial services industry. The second research question is addressed by condensing the main argument, i.e. the role of organizational routines, into a microeconomic production function. This allows an explicit modeling of the impact of routines on process performance. In doing so, we can go one step further than most parts of the literature by mapping conceptual statements to a microeconomic production function explicitly describing the transformation process within the firm.

## THEORETICAL BASE

Information systems are crucial in many industries, but especially in the finance sector where core competence is to deal with information and their manipulation based on information systems (Broadbent and Weill, 1993). This increasing importance has created challenges for the management of firms regarding the allocation of financial resources to IT and the management of the IT resource. Regarding strategic information systems (SIS), large parts of the literature focus on the underlying concepts supporting the conduct of a specific competitive strategy while providing the basis for a competitive advantage. Especially this underlying concept is addressed in the following sections.

### Resource-based View

A great part of the literature focusing on the impact of IT on competitive advantage is based on the RBV which scrutinizes the connection between the resource endowments of a firm and its gaining and sustaining of a competitive advantage (Barney, 1991; Peteraf, 1993). Early studies focused on key characteristics of resources. Especially value, rarity, inimitability, insubstitutability, and immobility have been identified (e.g. Grant, 1991; Barney, 1991; Peteraf, 1993). Mostly, either single IT components and their effect on organizational performance were analyzed or IT investment was related directly or via intermediate variables to performance (see e.g. Clemons and Row, 1991). When considering resources regarding their potential to sustain a competitive advantage, especially organizational routines seem to have the characteristics aforementioned. A routine develops over time and is socially embedded making it immobile, hard to imitate and to substitute, thus showing strong ex-post limitations to competition (Peteraf, 1993). Smoothly functioning routines between IT and business units are seen as valuable leading to a more effective development and use of IT. Such routines are also rare as they are idiosyncratic and not broadly distributed and available. Therefore, routines can have the potential to gain and sustain competitive advantage according to the RBV.

Later approaches known as the capability-building perspective (Makadok, 2001) focused primarily on the ability to deploy resources (e.g. Teece, Pisano and Shuen, 1997; Bharadwaj, 2000; Eisenhardt and Martin, 2000). Grant (1991) points out that resources are inputs into the production process but mostly do not create value on their own. Capabilities can be defined as “complex bundles of skills and accumulated knowledge, exercised through organizational processes that enable firms to coordinate activities and make use of their assets” (Day, 1994). According to Day capabilities are based on organizational processes which in turn can be identified as routines (Collis, 1994; Nelson and Winter, 1982) referring to “regular and predictable patterns of activity” (Grant, 1991).

### Alignment

In the RBV literature special resources are notorious for the business IT relationship. These are the so-called relationship asset dealing with the interworking between IT and business unit (Ross, Beath and Goodhue, 1996). Furthermore, IT management processes known e.g. from Sambamurthy and Zmud (1997) were seen as essential for IT business activities. A related strand of research that is also focusing on the relationship between business and IT is the alignment literature. The IT business alignment literature predicts that the alignment between the business and IT domain is essential for a positive outcome of IT investments (Broadbent and Weill, 1993; Henderson and Venkatraman, 1993).

Corresponding to the process view taken in this paper, alignment can be defined “as a process in which managers participate in the exchange of knowledge” (Kearns and Lederer, 2003). The impact of alignment on organizational performance was proven in several studies and was introduced in the form of the strategic alignment model (SAM) by Henderson and Venkatraman (1993). They argue that the creation of value from IT investments needs an alignment between business and IT strategy in both strategy formulation (product-market choices) and implementation (choice of firm structure).

The alignment model emphasizes the strategic fit between strategy formulation and implementation for business and IT and also the functional integration between business and IT on the strategic level and the operational level. An important point is that the entire model calls for cross-domain relationships between business and IT and between the strategic and operational level (Henderson and Venkatraman, 1993). This is also consistent with Keen (1991) who states that “the key to alignment is relationships, not ‘strategy’”. The importance of these relationships provides a direct link to the concept of the relationship asset (Ross et al., 1996) known from RBV literature which was identified as based on routines. Correspondingly, Sambamurthy and Zmud (1999) see alignment as a dynamic capability evolving as specific management processes engaged in adapting IT to business et vice versa, for example. This is also supported by a study of Reich and Benbasat (2003).

Thus, it is appropriate to identify routines as an underlying construct for the RBV concept of capabilities and for alignment making it central for the understanding of the transformation process from IT resource to an organizational impact. RBV in its different research strands as well as the alignment literature are engaged in identifying the connection between IT and firm

performance. But a combination of the valuable insights of these research strands is still lacking. This issue is addressed in the following sections.

## DEVELOPMENT OF MODEL

### Case studies

In order to address the role of alignment and routines in the development and deployment of SIS, after discussing the methodology this section presents preliminary results of four case studies in the German financial services industry.

#### *Methodology*

Conceptual and theoretical studies apply theory to explicate IT business value; analytic studies are used to develop models, and empirical studies are deployed for testing (Melville et al., 2004). One form of empirical studies often employed in IS research is case studies investigating a phenomenon within its real-life context (Yin, 2003). In the following, case studies carried out in the financial services industry are presented focussing on alignment and routines. Case studies have to be prepared and carried out thoroughly in order to achieve the necessary rigor. During design and preparation it is important to make explicit the research question, propositions and unit of analysis (Yin, 2003). One research question employed for this paper is: how does IT business alignment impact process performance. These resources can be defined as IT infrastructure, IS application, and IT personnel and business resources where the latter are predominantly skills and experiences (Melville et al., 2004). How- and why-questions are identified as being appropriate for case studies (Yin, 2003). The proposition used in the cases is the theoretically grounded proposition that a transformation process linking IT and business resources is determined by routines, especially routines in the planning and designing phase. The unit of analysis is chosen concordant with literature as a specific business process which is the credit process for small and medium enterprises (SME).

After the definition phase we selected cases according to Eisenhardt (1989) in that the cases were selected out of banks serving the credit market for SMEs in specific regions of Germany, thus constraining extraneous variation. Specifically, the credit process for SMEs and the core application employed are investigated. One part of these case studies focus on alignment and routines which will be briefly reported in the following.

For carrying out a case study we developed case and interview protocols, discussed it within the research community prior to testing it. After testing the adapted documents are used for the case studies (Eisenhardt, 1989; Yin, 2003). Interviews were accomplished in two parts. One part was carried out with a semi-structured questionnaire to cover a wide variety of contextual variables and the second part with a structured questionnaire. Data was complemented by reports, other documentation like process documentation and academic literature. The interviewees validated the collected data as well as the results. This procedure is concordant with the literature in case study methodology (Yin, 2003; Lee, 1989; Eisenhardt, 1989). The unit of analysis is the SME credit process comprising essentially the sales process and the credit processing where the decision if a credit is granted or not involves both parts. Employing four case studies interviewing the credit process manager in charge of the process, the market view on the process and the internal view were investigated. The market view deals with market reaction on the produced financial service while the internal view deals with the success factors for the process normally invisible to market participants.

#### *Preliminary findings from four case studies*

The banks in our sample are cooperative banks and savings banks which serve regional markets in Germany. They use core applications run by service providers, each serving between 300 and 500 banks. The core application employed covers a great part of the credit process functionality. The single credits are produced by a combination of pure manual activities (e.g. customer contact), fully automated activities (e.g. payment), and predominantly an interworking of human and IT resources.

Five factors turned out to be important from an external (market) perspective: price (interest rate of credit), process cycle time, flexibility to change the process responding to regulatory or market changes, transparency of evaluation criteria and procedure, and skills of sales personnel as first contact between a customer and the bank. But how are these factors related to one another? Beside the price, counter-intuitively given that corporate customers' investment projects are mostly planned for a long time, *ceteris paribus* cycle time showed to be the most decisive factor for market success. The reason given to us was the fact that in SMEs the technical and project managerial items were indeed planned in advance including the financial aspects. But the formal procurement of financial means was only considered (nearly) after finishing technical planning and under time pressure. Also, once the investment decision is made, customers simply do not like to wait for the provision of financial means. Furthermore, a short cycle time serves as a quality signal for unobservable processing activities.

Changing to an internal view of success factors of the SME credit process, the skill level of personnel was identified as important but sufficient in all cases. Managers do not believe an increase in skills to have a major influence on process quality. This is due to a fairly high education level and an employee experience of more than 5 years. The single most important aspect turned out to be mutual understanding between business units (e.g. sales and processing) and between the business units and the IT unit. The mutual understanding was identified as crucial for achieving flexibility as well. Mutual understanding was reported to arise from frequent interaction and, as far as the IT unit is concerned, from the business orientation and basic business knowledge of the IT personnel. Regarding this interaction often very formally and bureaucratic procedures to the service providers were reported limiting the ability to react flexibly to a changing environment. Regarding the cooperation with external service providers, the managers all stated much higher satisfaction with internally produced IT services which were all characterized by a substantially higher degree of informal interaction. The main reasons for this evaluation regarding the external service providers are: Little influence on product development because each bank is one out of hundreds served by the provider, spatial distance as opposed to the in-house IT department, and a lack of banking know-how.

The consequence is a reduced flexibility of the single bank to adapt to changing environments because required changes need a relative long transfer phase of know-how and cannot be carried out fast enough. This is evident in the answers to our questionnaire. IT business alignment was seen as essential in the development phase of a core application as well as in the deployment and operation phase. The single most important indicator was the mutual understanding, especially the clear understanding of business needs by the IT unit, or provider respectively. In the cases with a low rating of the degree of IT business alignment, the offered core application rarely covers requirements of the business and adaptation due to environmental changes is slow. Therefore, we can support alignment literature and RBV as the relationship asset is an important construct when explaining IT impacts. This asset is coded into routines reported in the cases as working procedures involving formal and informal interaction. The contexts of routines differ from minor changes to architectural changes providing different degrees of context complexity. Dependent on the actual setting of the structural linkages, as stated by theory, the context complexity can be resolved. The quality of the resolution expresses in both time it takes to resolve an issue and the fit of the solution with the business purpose. In all cases it can be reported that frequent, often informal, interaction causing mutual understanding is related to a better quality of the resolution process. In turn, the result of the resolution process is a reengineered credit process heavily relying on IS which also gives a strong link to the notion of complementarity: The reengineering of the credit process is aligned with the development of the corresponding information system. This result determines which resources to which extent and in which combination are employed, thus impacting the services produced. Therefore, the extent the SIS used in the credit process can support a business strategy depends on alignment processes.

Due to the importance of IT business alignment which builds on routines, these effects should be explicitly considered in formal models. IT and business resources manifest in the concrete SME credit process yielding externally valued parameters such as speed of process and also have an impact on the cost side because both a high resolution speed correlates with low costs and the resulting resource combination is more efficient. Therefore, the next section introduces the concept of routines, also underlying IT business alignment, into a microeconomic model.

### **Research Model**

Focusing on SIS which can be developed and deployed along a cost-reducing and/or product-differentiating strategy (Belleflamme, 2001), this section deals with a specific aspect of SIS. As SIS are embedded in business processes used to produce services for the market, we analyze the role of routines for gaining and sustaining a competitive advantage. The business process was chosen as unit of analysis because a firm comprising several business processes may excel in some, be average or worse in others leading to some net effect at firm level (Barua, Kriebel and Mukhopadhyay, 1995).

As has been shown in the previous case study section routines are important for alignment and form the basis for the effective development, deployment, and operation of a SIS. Routines are a basic concept underlying the notion of a capability (Eisenhardt and Martin, 2000) and also underlying the notion of alignment (Henderson and Venkatraman, 1993). Routines can also be interpreted as resources bearing the characteristics necessary to gain and sustain a competitive advantage (Barney, 1991). Often referred to in the literature is an enhancing relationship between IT and business resources implying some form of complementarity (Melville, Kraemer and Gurbaxani, 2004). Complementarity means that “the marginal returns to one variable are increasing in the levels of the other variables” (Milgrom and Roberts, 1995). Adopted for IT and business, a higher level of IT will lead to an increase of the marginal returns of business activities which was also found in some studies (e.g. Powell and Dent-Micaleff, 1997) and could be supported by the case studies as well. The discussion regarding alignment and capabilities showed that routines are in a central position for explaining cross-domain relationships as well as the transformation from IT resource to process impact. Complementarity between IT and business can only work if these

relationships are well established which implies effective routines. Thus, effective routines involving IT and business units are necessary to gain complementarity effects in that information is exchanged leading to the creation of knowledge which in turn is necessary for achieving a better fit between IT and business resources. One way of researching these effects is applying a productivity perspective referring to the development and deployment of SIS under a cost-reducing strategy. Productivity can be studied appropriately using a production-oriented approach which is employed in the following. Therefore, we can now develop a service production function explicating the concept of routines. Considering SIS in a production function requires separating the SIS into single components which can be treated as inputs. This involves the representation of these components by proxies (e.g. specific IT hardware by IT capital). A SIS consists of technical and human components which can be considered as inputs and represented within a production function. But, what essentially makes up a SIS is how these inputs are combined and activated regarding business objectives. This is determined by organizational processes which were discussed under the notion of routines. These routines are employed among human capital leading to the exchange and adoption of information, tacit knowledge, and attitudes. The alignment of IT with business purposes as well as within the single domains is driven by routines allowing for a more efficient and effective IT usage. Routines then are a part of what is called dispositive factor in production theory, determining the combination of elementary factors of production which are usually implicitly shown in functional form.

Introducing routines into a production function is a new approach. Usually, there is the general recognition of workplace practices (e.g. Bresnahan, Brynjolffson and Hitt, 2002). Drawing on this work, in the following a production function is constructed incorporating the effect of routines.

### Analytical Model

In this section first the formalization of routines is discussed followed by the modeling of a production function.

Routines are based on interaction between individuals or organizational units and can be measured using the strength of tie-argument of Granovetter (1973). He developed the strength of a tie as a dichotomous variable that can be either weak or strong at a given point of time. The interaction is necessary between the IT and the business unit in focus of this paper where knowledge to design and develop a complex system resides in different organizational units and strong ties provide the channels for the knowledge flow and increase the probability of sharing information while enhancing the development of a shared understanding (Tiwana, Bharadwaj and Sambamurthy, 2003). Accordingly, a routine can be specified by relating the context complexity to the structural linkages (Hansen, 1999; Schrott and Beimborn, 2003; Tiwana et al., 2003).

Briefly, we consider a routine as a relation between the task complexity, standardized between 0 and 1, and the strength of the structural linkages between IT and business units. This relation is denoted as  $p$  and also standardized between 0 and 1 where 0 is a dysfunctional routine and 1 is the complete fit with the task. Parameter  $p$  depends on the accumulation of know-how and the ability to interexchange knowledge between the organizational units involved. In contrast to traditional learning curve considerations,  $p$  is not applied to the amount of output produced in the past but reflects "problem solving capability". Therefore, an Euler function is employed which is common in microeconomic theory when considering technical progress.

One of the most often applied production functions is the Cobb-Douglas function which is appropriate for our purpose because focusing on integrating routines into a production function.

$$y = \eta e^{\beta p} \prod_{i=1}^n r_i^{\alpha_i} \forall i \in 1..n, \eta > 0 \text{ and constant}; \beta \geq 1, 0 \leq p \leq 1, 0 \leq \alpha_i < 1 \text{ and constant}$$

with  $r_i$  representing the factors of production and  $y$  the output.  $\alpha_i$  is the elasticity of production.  $\eta$  represents the traditional technical progress and statistical noise.  $p$  represents the probability of successfully completing the project of designing a transformation process which denotes a routine. Parameter  $\beta$  is introduced as a scaling factor because the order of magnitude of the described effect cannot be restricted a priori.

Because of  $0 \leq \alpha_i < 1$  the increase of output while increasing factor input is under proportional.

The effect of the routine implemented into the production function can be interpreted in a classical sense that a smoothly functioning routine represented by a high value of  $p$  leads either to more output (considered as quality-adjusted output) given the amount of input factors, or less factor input at given output. Thus, routines are the link between IT and business units necessary to define the resource combination. In an extreme case, IS is worthless, or even damaging for business, if not properly aligned with the business purpose. Conversely, a well aligned IS is capable of supporting the competitive strategy. Two expressions of this alignment inducing the complementary effect between IT and business resources are the efficiency of production and the effectivity in that a quality-adjusted output as demanded by strategy can be produced. This production

function approach covers SIS in two ways. First, IT in general is represented by a proxy measure used to fill one or more “classical” input factors belonging to the class of IT capital. Secondly, the planning and designing phase incorporating the knowledge of business and IT personnel to form a SIS supporting the strategies is represented by routines and coded as a proxy by a newly introduced parameter. RBV and alignment literature predicts this factor as important for explaining business performance. Therefore, for one specific aspect of SIS it is shown how to analytically consider the effects of this factor known from literature and also supported by the preliminary results of the presented case studies.

## CONCLUSIONS

Methodologically, we used a critical discourse of RBV and alignment literature discussing the basic underlying concept of routines and complemented it by an analytical model based on a production economic based approach incorporating routines, thus demonstrating the impact of routines on service production. In this context, it was shown that especially IT business alignment coded in these routines is decisive for both the implementation success of SIS and the supporting of competitive strategies. This was supplemented by four case studies.

An obvious limitation of the approach is that the production function just covers one aspect of SIS which is production oriented. Additionally, this function is designed for the technical domain of a bank’s service production. The financial domain (e.g. factor “money” as nominal good) is not considered, but could be introduced. As a consequence, liquidity of a bank in the actual function is not restricted. Furthermore, the functional representation itself has restrictions (see Dewan and Min, 1997).

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