

2008

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## Recommended Citation

Wagner, Heinz-Theo, "IT Business Alignment and Process Performance: Results from a Survey in the Finance Industry" (2008). *ECIS 2008 Proceedings*. 153.

<http://aisel.aisnet.org/ecis2008/153>

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# IT BUSINESS ALIGNMENT AND PROCESS PERFORMANCE: RESULTS FROM A SURVEY IN THE FINANCE INDUSTRY

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## Abstract

*The value of IT and its impact on competitive outcomes is the subject of debate and controversy in theory and practice. In this context IT Business Alignment (ITBA) has been found to be a key CIO issue and a driver of IT value, but there is still a lack of coherent theoretical explanations for why and how ITBA influences outcomes. This study draws on the knowledge-based theory to develop and test a process-level model of IT Business Alignment examining a primary business process with its core information system.*

*At a process-level of analysis the influence of ITBA on business process performance is investigated, encompassing IT personnel flexibility and IS usage as essential resources. ITBA at an operational level is based on three frameworks of prior research and proposed as concept for further research.*

*The model is tested using data from 136 banks and shows that ITBA at an operational level indeed has an effect on process performance, and that this effect is indirect and fully mediated by IS usage and IT personnel flexibility.*

*Keywords: IT business alignment, knowledge-based theory, process performance.*

# 1 INTRODUCTION

The question of how IT contributes to business value is controversially discussed among researchers and practitioners as well (Sambamurthy & Bharadwaj & Grover 2003). Numerous studies are carried out showing both the importance of this question and the lack of a cohesive answer. Therefore we still have much to learn about the underlying mechanisms connecting IT assets to their impacts on the firm (Bharadwaj 2000; Peppard & Ward 2004).

In this paper, within the stream of IT valuation research (Kohli & Grover 2008) and based on existing literature on the knowledge-based theory and IT business alignment we propose that the interplay between the IT and the business domain is an important argument in explaining the value contribution of IT. Following recent research, we employ a process-level perspective to avoid aggregation problems.

Our research question thus is:

- How and to what extent is the IT resource related to process performance?

The paper contributes to the literature by:

- Showing that ITBA is influential not only at the strategic level but also at the operational level
- Proposing a measurement model for operational IT business alignment (ITBA)
- Demonstrating that operational ITBA indirectly influences process performance
- Showing that operational ITBA is fully mediated by IS usage and IT personnel flexibility

The paper is structured as follows. First, the existing literature is reviewed and, based on that, the research model is derived. Next, the constructs and hypotheses are defined. Third, the study assessing the hypotheses is discussed. Finally, the results are interpreted and the implications of the findings are discussed.

## 2 THEORETICAL FOUNDATION

Choosing an appropriate theoretical basis as a starting point to predict or to interpret observations is a major task. Referring to prior literature IT business alignment, which is in focus of this paper, and its effects, are mainly framed under two perspectives. First, alignment can be viewed under a resource-based perspective (Kearns & Lederer 2003) considering alignment as a resource contributing to performance. Second, using the dynamic capabilities view alignment can be interpreted as a capability to achieve a business IT fit (Henderson & Venkatraman 1993). While the dynamic capabilities view reflects turbulent environments and deals with the capacity to sense and to seize opportunities, and to reconfigure resources (Teece 2007), this research adopts a process-level perspective and deals with the internal factors leading to process performance, not focussing on environmental changes and their influence. Therefore the resource-based view serves as the theoretical basis, because it provides an appropriate lens for analyzing how internal factors of a firm can contribute to process performance. More specifically, we concentrate on the knowledge-based theory (KBT) (Grant 1996) that builds on the RBV (Alavi & Leidner 2001; Pitelis 2007), because the theoretical insights of the KBT provide a strong basis to explore the nature and importance of the relationship between the IT and business human resources for the use of IT to enhance performance that is the central idea behind IT business alignment (Keen 1991).

### 2.1 Knowledge-based Theory (KBT)

The KBT suggests that the ability of a firm to successfully deploy resources relies on the knowledge residing in the human capital of a firm and the development of interrelated knowledge across

organizational units with organizational routines as mechanisms of knowledge integration (Grant 1996).

Knowledge includes both explicit knowledge which can be written down and tacit knowledge which encompasses know-how, skills, and practical knowledge (Grant 1996). Knowledge is accumulated through experience, learning, and ongoing practices and is especially addressed by the knowledge-based theory stating that knowledge is the principle resource of a firm (Grant 1996). In this view, achieving a competitive advantage is in part a function of the efficiency of knowledge integration spanning broad areas of knowledge. Lots of studies investigated knowledge in various forms, e.g. human resources, managerial IT skills, and mostly discovered a (strong) positive link to some performance measures (Castanias & Helfat 1991; Carmeli & Tishler 2004). The knowledge of the human resource is generally distributed among individuals and is often tacit in nature providing for stronger ties to the firm, which may thus afford a sustained competitive advantage (Galunic & Rodan 1998). This knowledge is accumulated over time and guided by learning mechanisms (Eisenhardt & Martin 2000).

## **2.2 IT Business Alignment**

Most alignment studies found a positive impact of IT business alignment on firm performance (Bergeron & Raymond & Rivard 2004). In the case of IT business alignment, the fit between strategic and/or structural aspects of the business and the IT domain is in focus (Henderson & Venkatraman 1993). It is the joint, complementary effect between IT and business must be in place that leads to organizational performance.

Drawing on the KBT, we view alignment as a process that promote knowledge sharing (Kearns & Lederer 2003) and is essential in determining IT profitability (Tallon & Kraemer & Gurbaxani 2000).

Although numerous contributions studied IT business alignment, there is no coherent conceptualization of alignment. This is especially the case for the operational level of alignment. To conceptualize alignment at an operational level, we refer to three frameworks and split IT business alignment into three dimensions:

We will focus upon:

- (1) *Shared domain knowledge*: Nelson and Cooprider (1996) found shared knowledge to be important for IS performance. This was supported by Reich and Benbasat (2000) who found it to be a significant factor in predicting long- and short-term alignment.
- (2) *Structural linkage* between IT and business, (Reich & Benbasat 2000; Tiwana & Bharadwaj & Sambamurthy 2003), which also encompasses the communication enablers
- (3) *Cognitive linkage* between IT and business (Tiwana et al. 2003), leading to mutual influence and is an addition to the work of Reich and Benbasat.

Additionally, we focus on the operational level of IT business alignment referring to the operational integration between the alignment domains IT and business structure of the SAM (Henderson & Venkatraman 1993).

## **3 RESEARCH MODEL**

### **3.1 Structural Model**

As mentioned in the previous chapter, most of the former research did not address the process-level. This leads to the fact that there are a few process models and hardly validated instruments at that level of research. Therefore, the construction and assessment of the variables was an important task for this

paper. The variables had to be chosen concordant to an accepted instrument or framework (Tallon et al. 2000) and adapted to the research context.

The research model proposed by this paper was derived in following steps:

- First, adopting the process-level perspective the credit process of banks was chosen for following reasons:
  - Due to the information intensity of the finance industry and its highly IT-dependent bank business (Barua & Kriebel & Mukhopadhyay 1991) it is expected that effects of IT might be easier to detect.
  - The credit process is a primary business process of a bank and was chosen because of its relevance for a bank's performance.
- Second, based on the framework of Melville et al. (2004) and accompanied by expert workshops and case studies, we developed the research model for the credit process.
- Third, as suggested by Eisenhardt (1989), the indicator questions have been derived mainly from validated questionnaires from literature and adapted to our purpose. The indicator questions, related research and the allocation to the variables are reported in table 1.

Recently, Melville et al. (2004) also adopted a process-level perspective and proposed a framework to guide future research. Discussing the IT business value generation process of the focal firm, they argue that IT resources and complementary organizational resources have to be combined into a business process yielding business process performance.

The following sections discuss the constructs and the posited hypotheses.

### 3.2 Construct and Hypotheses

Referring to Eisenhardt (1989), the constructs were built by using indicator questions from validated questionnaires from literature, in parts adapting them to the purpose of this study. The related research is reported in the subsequent sections.

The posited hypotheses and the constructs are discussed in the following sections. IT business alignment is built on a set of enablers and refers to the mutual understanding between business and IT representatives. IT personnel flexibility depicts the ability of the IT unit to (re)act quickly. Finally, IS usage reflects the use of an information system by the business employees within the business process.

The following figure shows the research model to guide the reader when subsequently discussing the constructs and hypotheses.

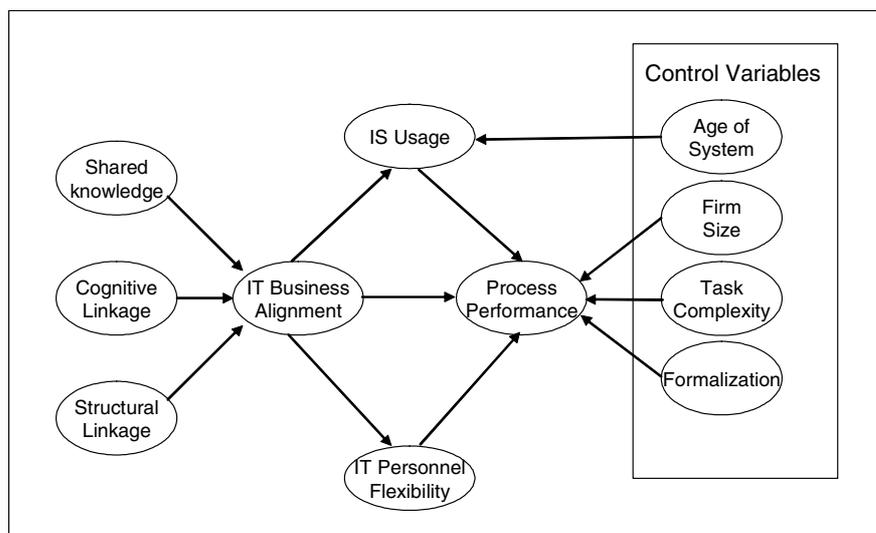


Figure 1. Research model

## **Process Performance**

Based on Mooney et al. (1996) business process performance can be measured using costs, quality and time dimensions. These dimensions represent the efficiency of business processes in order to generate a desired output or service. In this paper the focus is on quality due to its importance for the credit process. Quality in the credit business refers to granting, processing, and monitoring a credit in concordance with regulatory and bank-internal requirements regarding risk evaluation and certain documentation rules. Missing the quality standards, e.g. regarding the rating or the necessary complete documentation, causes a delay due to subsequent amendments and along with it more cost until the process can be completed. Moreover, an error during the credit process may lead to granting a credit subsequently causing a higher ratio of bad loans resulting in a lower profitability of the business. Thus, the basic assumption is: the higher the quality, the higher credit process performance.

## **IS usage**

IS usage refers to the extent information systems are used to support a firm's organizational objectives whether to improve operational efficiency or to achieve competitive advantage and was identified as the missing link explaining the impact of IT on performance (Devaraj & Kohli 2003).

Therefore, for the purpose of this paper, IS usage is defined as the extent to which an organization deploys IT to support operational tasks, following the process evaluation perspective of Grover et al. (1996). When investigating IS usage the focus is on the core IS employed for credit process.

Masseti and Zmud (1996) investigating EDI usage in complex organizations proposed four dimensions (volume, diversity, breadth, depth) to measure the extent to which IT is deployed. In the context of this paper the dimensions volume and diversity are not appropriate, because the focus is just on one type of credit which is the credit for small and medium enterprises (diversity) and because it is expected that all credits are processed by using the core IS (volume). Therefore, both dimensions volume and diversity would not reveal variations in usage patterns.

For these reasons, the dimensions breadth and depth are more appropriate. Breadth is redefined as the extent to which the IS covers the five aggregate-level activities of the credit process (sales, credit assessment and decision, servicing, risk management and monitoring, workout). Depth is redefined as the extent to which the IS covers the functionality necessary to fulfil each activity.

It is widely accepted that firms cannot gain benefits from IT unless it is effectively used (Soh & Markus 1995). Therefore, we formulate following hypothesis:

Hypothesis 1: There is a direct and positive impact of IS usage on process performance.

## **IT personnel flexibility**

According to Koste and Malhotra (1999) flexibility can be defined as the ability to change or react with little penalty in time, effort, cost or performance.

Byrd and Turner (2001) differentiate the concept of flexibility into a physical and a human component. The physical component refers to modularity and integration (compatibility and connectivity), the human component merged into a factor termed IT personnel flexibility.

In this paper the focus is on IT personnel flexibility for following reasons:

- First, the technical flexibility of an IS cannot be exploited without a corresponding IT personnel flexibility. In particular, an informal organization can react quickly to changes (Chan 2002).
- Second, Byrd and Turner (2001) show that IT personnel flexibility contribute the most to performance measures.
- Third, participants of this study are business representatives who can more readily assess the flexibility of IT personnel than technical characteristics of a system.

Hypothesis 2: There is a direct and positive impact of IT personnel flexibility on process performance.

## **IT Business Alignment**

The interaction between the business and the IT domain is not restricted to the strategic level. Rather strategy has to be transformed into daily business to achieve effects (Gordon & Gordon 2000). Although the SAM incorporates strategic and structural levels of alignment types and domains, most research focuses on the strategic level, leaving a gap at the structural or operational level (see review by Bergeron et al. 2004).

Therefore, there is not a single conceptualization of alignment at an operational level and this paper builds upon the works addressing alignment of Reich and Benbasat (2000; 2003; 1996), the work of Tiwana et al. (2003) analyzing intra-organizational linkages, and the work of Nelson and Coopride (1996) investigating shared knowledge.

Measurement items for the different dimensions outlined before have been derived from prior research and matched to the dimensions of this operational alignment construct, their respective origin is given in prior research (Wagner 2006). Each of the three dimensions of alignment (shared knowledge, communication, cognition) has been measured each with indicators derived from the underlying frameworks and related work. In literature, there is evidence that alignment directly influence performance. Therefore, we formulate following hypotheses:

Hypothesis 3: Higher levels of operational IT business alignment directly and positively influence business process performance.

Additionally, we expect IT business alignment to influence both IT personnel flexibility and IS usage for following reasons.

- First, alignment processes provide the IT domain with business knowledge (Reich & Benbasat 2000) and thus increases the accessibility and availability of knowledge (Zahra & George 2002).
- Second, alignment facilitates knowledge sharing through frequent interaction and cognitive linkage between the IT and the business domain (Reich & Benbasat 1996; Tiwana et al. 2003), thereby enhancing the efficiency of IT resource reconfigurations (Alavi & Leidner 2001).
- Third, alignment enhances the understanding of business practices and changing the IT professional's perception of IT as a resource (Duncan 1995) by increasing knowledge reach and richness through perspective-sharing and sense-making (Sambamurthy et al. 2003), thereby.

Thus, viewed as process of knowledge-integration (Grant 1996), the primary impact of operational IT business alignment on IT personnel flexibility is to enhance business orientation, business knowledge, and the understanding of business needs.

Hypothesis 4: There is a direct and positive impact of operational IT business alignment on IT personnel flexibility.

From our discussion regarding the IS usage process and the reasons mentioned above we also expect that alignment influences IS usage.

As previously mentioned, the effective utilization is necessary to get business value out of IT. IS support could determine how successful a firm is in using IT to improve its core competencies. Ravichandran and Lertwongsatien (2002) suggest that a mature IS support process ensures the effective utilization of IS and thereby enhance the business value, because ineffective IS operation has the potential to damage carefully built reputations for quality and reliability in product and service offerings. In particular, banks are affected, because their business operations are permeated by IT

IT business alignment increases the likelihood of providing a mature IS support process, for almost the same reasons as IT business alignment supports developing systems more relevant for the firm (Avison & Jones & Powell & Wilson 2004). This is essentially, achieving a fit between business needs and the capacity of the IT structure to deliver the needed services (Holsapple & Luo 1996) by enhancing business orientation, business knowledge, and the understanding of business needs.

Hypothesis 5: There is a direct and positive impact of operational IT business alignment on IS usage.

## Control variables

We incorporate four control variables into our model that are described in the following.

First, drawing on contingency theory, we introduce firm size and formalization as control variables (Raymond 1990), then complexity and age of IS are described.

**Firm size:** Organizational size is one of the most commonly studied factors in literature. In our study, organizational or firm size is defined by the total assets of the banks. We expect that the firm size is negatively and directly related to process performance, because large firms tend to be more inflexible and have higher administration costs than small firms (Li & Ye 1999).

**Formalization:** Organizational maturity is the degree to which organizational processes are systematized and formalized through rules, procedures, and management practices (Raymond 1990). We relate organizational maturity to the degree of its up-to-date documentation. What is well understood does not include causal ambiguities and can be made explicit (Nonaka 1994) implying that an up-to-date documentation is correlated with an improved process performance (see also Raymond 1990).

**Complexity:** Complexity measures both the analyzability and the predictability of problems an individual encounters in his task environment (Sanders & Courtney 1985). We hypothesize that complexity results in a decrease of the process performance, because additional resources are necessary to manage complexity.

**Age of system:** The majority of firms start to reap benefits from the systems from the second year after implementation (Gattiker & Goodhue 2005). The length of use was also reported to be one of the most significant factors for the impact of DSS use on a performance variable (Le Blanc & Kozar 1990). Therefore, we expect that the longer the system is in place the higher the level of IS usage.

## 4 ANALYSIS

We first present the research methodology and the instrument construction, followed by the presentation of the research results.

### 4.1 Research Methodology

This study employs a survey among German banks and focuses on the SME credit process. In 2005, questionnaires were mailed to Germany's top 1,000 banks (according to total assets). 136 completed questionnaires were returned, resulting in a response rate of 13.6% covering about 21% of the Total Assets of these banks. The constructs are operationalized at a business process level. The questionnaire was mailed to the chief credit officer in each bank accompanied with a cover letter explaining the intention of the survey. This approach involves two perspectives.

Empirical research regarding alignment at the operational level is very rare. Therefore, as suggested by Eisenhardt (1989), the indicator questions have been derived mainly from validated questionnaires from the literature and adapted to our purpose. Operational ITBA is modelled as second-order construct and is based on three sets of enablers as discussed in the previous sections.

To account for external validity several measures are carried-out. First, non-response bias was tested. For this, it was distinguished between respondents and late respondents who responded after a reminder. Following Kearns and Lederer (2004) the late respondents (52.2% of all respondents) were treated as non-respondents, because they share similarities with non-respondents. Using both the Mann-Whitney test and the Kruskal-Wallis test resulted in rather high values of P (0.59) indicating that non-response bias cannot be assumed. Second, common method bias was tested using Harman's factor test (Podsakoff & Organ 1986) that showed no single factor accounting for the majority of variance, indicating that common method bias cannot be assumed. Third, the sample is statistically

representative regarding firm size (assets). Fourth, all constructs were assessed regarding their consistency using PLS bootstrapping with 500 re-samples. The results, reported in the next section, fulfilled all requirements for consistency and validity.

#### 4.2 Results

We used Partial Least Square (PLS) employing SmartPLS 2.0 (Ringle & Wende & Will 2005) to assess the measurement and the structural model. PLS was chosen because of two reasons. First, PLS is more appropriate if theory is untested in an application domain or tentative (Gopal & Bostrom & Chin 1993), and second, our data set predominantly consists of not normally distributed variables that fits to the distribution-free PLS estimation. The model to be tested is a second-order factor model with reflective measures. In a first step the measurement model was assessed. Each construct showed the required internal consistency, convergent validity, and discriminant validity. All construct intercorrelations are lower than the square root of the average variance extracted (AVE), demonstrating a good fit between indicators and constructs (Gefen & Straub & Boudreau 2000). The test of crossloadings between indicators and constructs exhibits the required loadings of indicator to constructs to assume discriminant validity (Gefen et al. 2000).

As an excerpt of the performed tests, table 1 exhibits the AVE and the composite reliability for each construct.

Name of construct	AVE	Composite reliability (Rho)
IT business alignment: knowledge	0.6394	0.8411
IT business alignment: cognition	0.7211	0.8857
IT business alignment: communication	0.8874	0.9594
IS usage	0.5995	0.8176
IT Personnel Flexibility	0.7205	0.9114
Process performance	0.5872	0.8097

Table 1. AVE and composite reliability

Finally, the structural model was tested to assess the relationships among various latent constructs. The statistical significance of the estimates was calculated by using the bootstrapping procedure with replacement of 500 sub-samples (Chin 1998b). Table 2 represents the results. With the exception of the path between operational IT business alignment and process performance, all path coefficients are significant at different levels of significance, supporting the corresponding hypotheses.

Name of construct 1	Name of construct 2	Path coefficient	T-value
Operational IT business alignment	IS usage	0.3236	2.9204
Operational IT business alignment	IT Personnel Flexibility	0.5776	7.8654
Operational IT business alignment	Process performance	0.0313	0.2880
IS usage	Process performance	0.3330	3.2093
IT Personnel Flexibility	Process performance	0.4711	3.8960
Control: IS-Age	IS usage	-0.1433	1.3584
Control: Formalization	Process performance	0.3066	3.3096
Control: Size	Process performance	-0.1305	1.4566
Control: Complexity	Process performance	-0.3925	4.6249
Dimension: Knowledge	Second-order construct Operational IT business alignment	0.4107	7.2474
Dimension: Cognition	Second-order construct operational IT business alignment	0.4787	9.0870
Dimension: Communication	Second-order construct Operational IT business alignment	0.4424	8.3166

Table 2. Path coefficients

The model explains 40.2% of the variance of our dependent variable “process performance”.

The predictive validity of the model can be assessed by estimating the total variance explained by the model ( $R^2$ ) and by calculating a predictive validation index  $Q^2$  (Geisser 1975). The Stone-Geisser-Test ( $Q^2$ ) determines the predictive relevance of the model. A value of  $Q^2$  lower than zero implies a lack of predictive power whereas a value above zero suggests sufficient predictive power. The predictive relevance is tested for each single construct (commonality measure) and for the model as a whole (redundancy measure) and resulted in all cases in values greater than zero.

## 5 CONCLUSION

Overall, the model of process performance proposed, including the second-order construct IT business alignment is well supported by the data. Our research showed that impact of IT business alignment on process performance is fully mediated by IS usage and IT personnel flexibility. Following table depicts the results for the hypothesis.

H1: Higher levels of IS usage directly and positively influence business process performance.	Supported
H2: IT personnel flexibility positively and directly influences process performance.	Supported
H3: Higher levels of structural IT business alignment directly and positively influence business process performance.	Not supported
H4: Operational IT business alignment positively and directly influences IT personnel flexibility.	Supported
H5: Operational IT business alignment positively and directly influences IS usage.	Supported

Table 3. Results for hypothesis

From a theoretical viewpoint, this paper provides an empirical analysis of the ways and the extent to which IT business alignment affects process performance.

The paper contributes to the literature by:

Subject	Selected References	Remark
Measurement model of operational IT business alignment	(Nelson & Coopriider 1996; Reich & Benbasat 2000; Tiwana et al. 2003)	There are no consistent models of operational IT business alignment. Therefore the construct operational IT business alignment was built upon three framework covering important aspects of the social dimension of alignment.
Path of influence of operational IT business alignment	(e.g. Tallon et al. 2000; Teo & King 1997)	While most research suggests a direct link of (strategic) alignment on performance variables. It is shown that on an operational level an indirect link can be assumed.
Mediating variables	(e.g. Devaraj & Kohli 2003; Byrd & Turner 2001)	Prior research has demonstrated the effects of IS usage and IT flexibility on performance measures. In contrast, showing the connection between alignment on performance mediated by these variables is very rare.

Table 4. Contributions

Thus, our research question formulated at the beginning of the paper can be answered and implications for practice be derived:

Research Question	Selected References	Answer	Implication
How and to what extent is the IT resource related to process performance?	(Peppard & Breu 2003)	Operational IT business alignment constructs reflect knowledge integration processes, indirectly influences process performance and is fully mediated by IT personnel flexibility and IS usage.	Due to the importance of the operational level of alignment management should focus more on this operational level, not considering alignment to be only a strategic task. It can be handled as an instrument for achieving higher process performance by improving IS usage and IT personnel flexibility.

Table 5. Implication

Regarding further research, it is suggested to extend the model by incorporating business factors such as business skills to evaluate the differential impact of IT-related and complementary business-related factors on process performance. Furthermore considering turbulent environments and its impact on process performance might be an interesting extension.

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