Organization Structure Determinants of Information Technology Budgets

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Organization Structure Determinants of Information Technology Budgets

*Completed Research Paper*

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Abstract

The information technology (IT) budget of a firm is one of the key financial ratios in information systems (IS) management and a persistent issue of discussion on corporate boards. Yet, many firms determine their IT budgets by relying on simplistic industry benchmarks. With the goal of understanding what structural organization characteristics influence the IT budget, we study the associations of five constructs measuring outsourcing, control span, and globalization of the organization with the relative IT budget level. Our data from a multiyear cross-country survey provides evidence for IT outsourcing being related to lower, and business process outsourcing, control span increase, and globalization increase to higher IT budgets. Our findings advance prior research on IS financials, which has so far centered around technology and industry variables, by providing insight into the structural organization characteristics that co-determine IT budget levels. Implications for the broader IS literature and for practice are discussed.

**Keywords:** IS financial research, IT budget, IT governance, globalization, outsourcing

Introduction

Between 2005 and 2020, information technology (IT) budgets grew globally by 39.5% (Statista, 2021) and became a crucial component within the budget allocation for the large majority of companies worldwide. Despite the wide adoption and diffusion of IT in organizations in the era of digitalization, controlling the IT budget is still one of the top management issues of organizations (Kappelman et al., 2020). The IT budget of a firm—usually stated as the percentage of its annual revenue—is one of the key financial ratios for CIOs and CFOs (Krotov, 2016). Its systematic determination is vital for companies that tend to compare their IT efforts with their competition. However, many firms still rely on simplistic industry averages as a benchmark for their IT budget (Kobelsky et al., 2008; Krotov & Ives, 2016).

While the downstream effects of IT investment have since been a center of gravity in the Information Systems (IS) literature, fewer works have paid attention to the upstream determinants of IT budgets and related metrics. The IS value stream of research has opened a broad discussion on the consequences of IT
investments including the effects on firm performance and the productivity paradox (e.g., Bharadwaj, 2000; Brynjolfsson, 1993; Brynjolfsson & Hitt, 1996). Dewan et al. (1998), in contrast, were among the first to analyze the upstream determinants of IT capital by examining the influence of the scope and scale of a firm. Kobelsky et al. (2002) and Kobelsky et al. (2008) further pursued this stream of work by differentiating internal and external factors influencing the IT budget level and they also analyzed how the industry strategic IT role interacts with these factors. Other studies used similar approaches, adding further perspectives such as static versus dynamic factors (Shen et al., 2015) and integrating insights from other countries than the U.S. (Dixit & Panigrahi, 2013).

However, research on the upstream determinants on IS financials has two empirical and theoretical shortcomings. Most prior studies in this string of work have used data from homogenous data sources (i.e., InformationWeek and Computerworld data). As a result, one shortcoming is that this literature has concentrated on technology and industry variables (which are available in these sources) and thus neglected other potentially relevant influences such as the structural conditions of a firm. Second, most studies have used data from one single country (the U.S.) and thus lack generalizability to other geographies. Hence, it is our conviction that in times of digitalization—where IT has become pivotal to business success—there is a theoretical and a practical need to broaden our knowledge of the determinants of IT budgets (Kappelman et al., 2020). This research, therefore, picks up a longstanding, yet under-addressed call for future research of Dewan et al. (1998) stating that “[...] future research could also focus on the relation between IT and the internal organization of the firm, examining issues such as centralization versus decentralization, span of control, standardization, and the hypothesized flattening of the managerial hierarchy on account of the adoption of IT” (p. 230).

Drawing on organization design theory (Daft, 2012; Mintzberg, 1980), we first develop the idea that three structural dimensions of firm organization have a determining influence on the IT budget level, understood as all planned expenses related to a firm’s IT function: specialization, hierarchy of authority, and centralization. We then draw on auxiliary perspectives, such as the IT outsourcing, IT governance, strategic management and globalization literatures, to conceptualize within these three dimensions five constructs (IT outsourcing degree, business process outsourcing degree, control span increase, globalization degree, and globalization increase), which we hypothesize to be associated with the IT budget level.

Carefully preprocessed cross-country data from 1652 companies that participated in the global Business and Information Technologies (BIT) survey between the years 2004 and 2011 (Mangal & Karmarkar, 2012) provide support for four of the five hypotheses. Specifically, we find empirical support for our theoretical arguments for why IT outsourcing is associated with lower IT budget levels, while business process outsourcing, control span increases, and globalization increases are associated with higher IT budget levels. Although our data is only slightly more recent than the data used in the past works on IS financials, we argue that our results underline our key argument that IS research can fruitfully leverage an organization design theory perspective when aiming to explain the upstream antecedents of IT financial metrics. The key practical implication is that firms should not be agnostic to their idiosyncratic organizational structure when determining their IT budget levels, even in times of digitalization. We also discuss limitations and opportunities for future research, before closing with a brief conclusion.

**Literature Review**

At the beginning of this research, we reviewed the literature to gain an overview of prior works that investigated IT financial metrics and to identify existing research opportunities. We focused on empirical works that examined factors that influence a company’s IT budget level or related constructs as the dependent variable. Relevant articles were primarily selected by scanning the AIS, IEEE and Scopus databases using the keywords ‘IT budget’, ‘IT spending’, ‘IT expenditures’ and ‘IT expenses’ and performing forward and backward searches from relevant papers. Our review identified only seven papers in this string of IS financial research that date to the years between 1998 and 2015 and used datasets from 1988 until 2010. Table 1 summarizes the identified works including their research focus, the theoretical grounding, data sources, and their key findings.

Prior IS financial research investigated different, but closely correlated constructs as dependent variables. Dewan et al. (1998) take an asset perspective and use IT capital as the dependent variable, which is described as “the total installed base of computer hardware, software, peripherals and services by a firm
Authors | Focus | Theory | Data (years) | Key findings
--- | --- | --- | --- | ---
Dewan et al. (1998) | Link between firm boundary characteristics (scale and scope) and IT capital | Economic production function framework | Computerworld (143 US firms, 1988-1992) | Firms with a higher degree of diversification in related lines of business, less vertical integration, and fewer growth options have greater IT investments.
Kobelsky et al. (2002) | Determinants of corporate IT budgets | Complexity theory | InformationWeek (892 US firms, 1992-1997) | The industry strategic IT role has a moderating effect on the relationship of level of earnings, diversification, and industry concentration on IT budget. Firms increase IT spending more in transformative industries to manage internal complexity related to diversification and the level of earnings.
Hu & Quan (2006) | External institutional influence on corporate IT budgeting processes in the financial sector | Strategy necessity and institutional theory | Computerworld & InformationWeek (57 US firms, 1998-1996) | The influence of previous IT budget levels is significant to determine an annual IT budget. The impact of competitors on the IT budget of a firm is not significant. However, the IT budget level becomes institutionalized by the IT budget levels of the perceived industry leader.
Kobelsky et al. (2008) | The effect of environmental, organizational and technological circumstances on IT budget levels, the Relation of IT budgets and firm performance | Contingency theory | InformationWeek (562 US firms 1991-1997) | Environmental complexity, resource availability, sales growth, and technological factors impact IT budget levels. IT budget levels are positively influenced by environmental uncertainty and industry concentration. The findings for organizational variables (operating profit, leverage and growth) confirm the internal affordability argument (Kobelsky et al., 2002; Hu & Quan, 2006).
Kobelsky & Robinson (2010) | The effect of IT outsourcing on IT spending | No explicit theory | InformationWeek (647 US firms 1999-2005) | Higher IT outsourcing is associated with higher IT spending. This impact starts immediately after the initial IT outsourcing and continues over time.
Dixit & Panigrahi (2013) | Determinants of IT investments at firm level in India | No explicit theory | Survey (239 Indian firms, 2007-2010) | IT capital stock and slack resources determine the level of future investment in IT. Contradictory to other findings, industry competitiveness seems to have no association with the IT investments in Indian firms.
Shen et al. (2015) | The effect of static & dynamic environmental, organizational and technological contingencies on IT budget | Contingency theory | InformationWeek and ComputerWorld (385 US firms, 1995-1997) | Firms in transformative industries spend considerably more on IT as they are more likely to obtain first-mover advantages, which increases the investment payoff. The influence of income on IT expenditure is significant, confirming the affordability argument of prior research. This effect is further reinforced in transformative industries. The effect of structural change on IT expenditure is marginally significant.

Table 1. Previous IS Financial Research

to produce revenue” (p. 225). Later work (Dixit & Panigrahi, 2013) differs from this approach by examining the determinants of IT investment which they define as the “sum of the spending related to the computers and IT systems, software, IT/ITES” in their analysis (p. 16). Other studies use the annual IT budget as an indicator for the annual (budgeted) IT expenditure (Hu & Quan, 2006; Kobelsky et al., 2008). The variable is usually scaled by the company’s sales from the previous year. Kobelsky et al. (2008) consider IT budget to be part of the overall firm budget and argue that this includes all planned expenditures directly associated with a firm’s IT function. They differentiate the IT budget from the actual IT spending emphasizing that, in practice, budget underruns and overruns can occur (Kobelsky et al., 2008).

The focus of earlier research was on both, firm-internal and firm-external (i.e., environmental) factors that may determine IT budget levels, most often tested in the same model. With regards to external factors, Kobelsky et al. (2008) analyzed the impact of environmental complexity and found that IT budget levels are significantly influenced by environmental uncertainty and industry concentration. This suggests that the fewer competitors are in a market, the higher the IT budget as expenditures are not competed away. Shen et al. (2015) complement this research by adding both, a static and a dynamic contingency perspective to their model. While Kobelsky et al. (2002) showed a significant moderating effect of the industry strategic IT role (i.e., whether IT has a transformative role in an industry or not) on IT budget levels, Shen et al.
(2015) showed that a direct effect may exist as well. This suggests that firms in transformative industries spend more on IT as they are more likely to obtain first-mover advantages and hence increase the payoff of the investment. Hu and Quan (2006) added another perspective to this literature stream. They argued that IT budgeting processes have become more institutionalized since firms tend to mimic the IT budgeting levels of their direct competitors as well as those of the perceived industry leader. They found that the budget levels of the perceived industry leader significantly influence the budgeting of individual firms. Their analysis, however, was limited to the financial sector (Hu & Quan, 2006).

Firm-internal factors that have been examined by prior research revolve around two main perspectives. The first perspective is to analyze boundary firm characteristics such as the degree of diversification, vertical integration and growth options that may impact IT budget levels. Applying this theoretical lens, Dewan et al. (1998) showed that firms with a higher degree of diversification in related lines of business, less vertical integration, and fewer growth options have greater IT investments as IT is used more extensively for coordination and control. Furthermore, Kobelsky and Robinson (2010) analyzed the impact of IT outsourcing on the IT spending, finding that against prior research suggestions, IT outsourcing is associated with higher IT spending. The second perspective of prior research is the internal affordability perspective, which implies that a firm’s budgeting depends on the financial performance of the previous year. Hu and Quan (2006) showed that the IT budget decision largely depends on the level of the IT budget level of prior years. Kobelsky et al. (2008) confirm the validity of this view by showing that operating profit is significantly related to IT budget levels, while financial leverage and sales growth is negatively related to IT budget levels. This means that firms “with higher operating profit, lower leverage and fewer high net present value investment alternatives have greater resources available to invest in IT” (Kobelsky et al., 2008, p. 975). Dixit and Panigrahi (2013) confirmed this finding by showing that the availability of slack resources is positively associated with IT budget levels for firms in India.

A different line of work has focused on IT investment decisions. Salge et al. (2015) investigated the motivation of IS investment decisions within hospitals and found that IS investments are not only made to find solutions for shortfalls, but also to ensure continuity of resource allocation as well as conformity with external norms. Dong et al. (2021) investigated the moderating effects of a general IT investment tendency on the relationship between performance shortfalls and IT investments. They found that firms with a general tendency to overinvest in IT also overinvest more extensively in IT as a response to performance shortfalls. This effect can be mitigated by corporate governance mechanisms. Xue et al. (2021) investigated the relationship between real earnings management (REM) and the commitment to IT investment plans. They found that REM is negatively associated with the commitment to IT investment plans and that this link can be weakened by IT decentralization and corporate governance mechanisms such as institutional ownership and takeover threats.

Altogether, there are comparably few works that analyze the influencing factors of IT budget levels. These studies have analyzed a number of both firm-internal and firm-external factors. However, previous studies have focused on a single country (USA: Dewan et al. (1998), Hu and Quan (2006), Kobelsky et al. (2002, 2008), Kobelsky and Robinson (2010), Shen et al. (2015); or India: Dixit and Panigrahi (2013)). In addition, most articles use variations of the affordability perspective (i.e., by estimating IT budget levels from previous year budgets) to represent internal factors. Shen et al. (2015) complemented this research by adding the perspective of structural change within a given company. Albeit this marks a first step to include structural factors in the analysis of IT budgets, Shen et al. only included one generic factor. Thus, further specification and a more detailed analysis of structural factors is necessary. In the following, we therefore draw on pertinent theory to identify other structural organization factors that may influence a company’s IT budget level. We hence follow the original call by Dewan et al. (1998) outlined above to “focus on the relation between IT and the internal organization of the firm” (p. 230).

Hypotheses Development

In order to advance the body of knowledge in IS financial research, we draw on organization design theory (Daft, 2012; Mintzberg, 1980) to hypothesize the influence of key structural dimensions on the IT budget. In accordance with Kobelsky et al. (2008), we view the IT budget as all planned expenses that can be related to a firm’s IT function. We chose to focus on the IT budget as opposed to actual expenses because of the previously described managerial relevance of understanding what influences IT budgeting levels.
Daft (2012) describes structural dimensions as the internal characteristics of an organization. These include the degree of specialization, the hierarchy of authority and the degree of centralization in an organization (Daft, 2012). Further prominent works in organizational theory have established similar concepts. Mintzberg (1980), for example, defines so-called design parameters of organizations which include job specialization, span of control, and unit grouping, which are closely related to Daft’s structural dimensions specialization, hierarchy of authority, and centralization. For the purpose of our hypothesis development, we adopt the conceptualization of Daft’s structural dimensions. Yet, it is important to note that our hypothesis development applies equally to other central references, such as Mintzberg’s design parameters.

Specialization in an organization refers to the degree to which organizational tasks are subdivided into separate jobs (Daft, 2012). The extent to which organizations use outsourcing is inherently related to their degree of specialization. For example, the review by Lacity et al. (2009) found that one reason why organizations outsource IT or business processes is to focus on their core capabilities. This allows firms to subdivide organizational tasks into essential and non-essential, focusing on the former with the goal to acquire specialized knowledge and skills. This motivates us to include the degrees of different types of outsourcing within organizations as one facet of their specialization.

The hierarchy of authority within an organization is characterized by its reporting structure, often depicted as the vertical lines on the organization chart (Daft, 2012). Daft (2012) explains the relationship between the hierarchy of authority within an organization and the span of control of its managers. He argues that, when the span of control of managers is narrow, the organization’s hierarchy tends to be tall, and vice versa. Because of this relationship, it is natural to assume that an increase in the span of control has an impact on the hierarchical structure of an organization. Hence, we see the increase or decrease of the control span as one way to describe the structural dynamics of the hierarchy of authority within an organization. We hence include control span increase as another variable into our research model.

Centralization within an organization describes the concentration of decision authority (Daft, 2012). When an organization is decentralized, decision authority is distributed across multiple structural entities. Previous research has found that globalized organizations tend to use organizational structures with a decentralized distribution of decision authority in order to cater for locally individual requirements (Harzing & van Ruysseveldt, 2004; Meyer et al., 2009). We hence argue that the degree of globalization of an organization represents one facet of its decentralization. Furthermore, we see an increase in the degree of globalization as an important facet of the structural dynamics of centralization within an organization. We therefore include globalization increase as a separate variable into our research model.

Extending the contingency logic implied by prior IS financial research (Kobelsky et al., 2008; Shen et al., 2015), we will in the following hypothesize the potential effects of these organization structure dimensions on the IT budget level of firms. Our research model is depicted in Figure 1.

**Outsourcing**

Our first construct is the IT outsourcing degree. Lee et al. (2004) define IT outsourcing, as “the practice of commissioning part or all of an organization’s IT assets, people, and/or activities to one or more external providers” (p. 128). The review by Lacity et al. (2009) substantiates that the main reason for outsourcing IT in the early 2000s has been the reduction of costs. The inherent microeconomic rationale is that outsourcing replaces internal costs for coordinating an activity within the firm with external transaction costs (Lacity & Willcocks, 1995). As long as these external transaction costs are lower than the internal coordination costs associated with the activity, outsourcing that activity leads to a cost reduction. Additionally, outsourcing leads to the division of labor thus that the internal IT staff can focus more on business-critical activities. For example, if IT maintenance is outsourced, the remaining IT staff can focus more thoroughly on the development of new applications and hence support innovation. This can lead both to a better performance with regards to these critical activities and to greater efficiency since the remaining staff can work in a more specialized and focused manner. Consequently, we hypothesize that companies with a higher IT outsourcing degree exhibit lower IT budget levels.
However, it is worth noting that numerous academic works found that IT outsourcing attempts do not always lead to the desired cost reductions (e.g., Barthélemy, 2001; Koh et al., 2004; Lacity & Willcocks, 1995). Additionally, Kobelsky and Robinson (2010) analyzed the impact of IT outsourcing on the IT spending of firms—and while they hypothesized higher IT outsourcing to be associated with lower IT spending, they found the opposite association. The authors explained their findings with goal of IT outsourcing to enhance IT capabilities, which in turn increases costs and budgets. Our hypothesis will therefore allow us to re-assess whether the common rationale to reduce costs through IT outsourcing actually translates into IT budgeting reality, or not.

**H1:** The IT outsourcing degree is negatively associated with the IT budget level. The higher is the degree of IT outsourcing of a firm, the lower is its IT budget level.

The cost efficiency rationale also applies to business process outsourcing (BPO) (Lacity et al., 2009). However, the cost reductions from BPO will only manifest themselves in the budget of the respective business area, rather than the IT budget (Lacity et al., 2011). Further, the outsourcing of business processes will presumably increase the coordination costs between the internal IT and the external business processes. This could be due to higher communication efforts in comparison to the previous internal communication as a result of cultural or time-zone differences or because the outsourcing company uses different software and standards. In accordance with this, Dewan et al. (1998) found that external processes compared to internal ones can lead to higher costs for IT in the context of vertical integration. Thus, we derive the following hypothesis:

**H2:** The BP outsourcing degree is positively associated with the IT budget level. The higher is the degree of BP outsourcing of a firm, the higher is its IT budget level.

### Span of Control

The span of control of managers in an organization is a key aspect of the organization’s hierarchy of authority. Daft (2012) argues that organizations with a wider managerial control span exhibit a flatter hierarchical structure. Previous work has produced inconsistent results as to whether the hierarchy of authority is related to investment into information systems (Winkler & Wessel, 2018). Based on the analysis of various spending indicators, Hitt and Brynjolfsson (1997) found that IT investments are broadly associated with a work system that favors decentralized authority. Lee and Grover (1999), in contrast, did not find any association between measures of IT and the centralization level of an organization. The management literature, however, has generally argued that organizations with flat hierarchical structures tend to prioritize flexibility to enable innovation (Georgsdottir & Getz, 2004) rather than focusing on efficiency.

We draw on the IT governance literature as an auxiliary perspective to translate this rationale into the IT context. The distribution of decision rights has been a central concern in the IT governance literature.
(Winkler & Wessel, 2018). It is a common rationale in the IT governance literature that firms competing on cost and scale tend to centralize IT decisions rights compared to those competing on differentiation and innovation (e.g., Weill & Ross, 2004). This is because in organizations that seek innovation will distribute decision rights to ensure greater IT responsiveness to the needs of their customers and employees, which in turn implies some level of redundancies and lower efficiency in IT. We assume the same rationale holds for organizations that decentralize authority by widening the control span of managers. Firms which focus on innovation rather than efficiency require a more flexible IT landscape in order to enable their innovative capacities, which is in turn more costly. We thus argue that firms which desire to evolve to a flatter hierarchical structure likely increase their IT budgets. On the contrary, firms which seek to evolve to a deeper hierarchical structure and thus narrow their managers’ span of control likely decrease their IT budgets with the goal of IT efficiency. We can posit:

**H3: Control span increase is positively associated with the IT budget level.**

*The higher is the control span increase, the higher is the IT budget level.*

**Globalization**

The degree of globalization of a company is one indicator of its structural decentralization. Daft (2012) points out that globalization requires new organizational designs to achieve coordination and flexibility. In the context of IT, this involves a globally aligned information management strategy defining data communication infrastructures, architectures, interfaces and databases (Karimi & Konsynski, 1991). For example, an early study by Karimi et al. (1996) found that effective IT integration within firms is a prerequisite of firms’ willingness to leverage IT for responding to globalization. This seems logical since subsidiaries in dispersed geographical regions need to communicate, exchange information, and share systems with each other (Karimi & Konsynski, 1991). We argue that such coordination effort will be permanently reflected in a higher IT budget and will grow with the number of geographically dispersed operations a company maintains. Consequently, we hypothesize that companies with a more globalized operational footprint exhibit higher IT budgets.

**H4: Globalization degree is positively associated with the IT budget level.**

*The higher is the globalization degree, the higher is the IT budget level.*

The strategic management literature has also looked at the resources that firms need specifically to enter into new geographical regions (Meyer et al., 2009). A new market entry poses high coordination efforts as new information systems, communication procedures and tools must be developed and aligned in the early stages. More recent studies specifically highlight two types of information technology resources that are key for companies to implement in to increase their export readiness: backbone IT systems such as advanced manufacturing technologies (Uwizeyemungu et al., 2018; Winkler & Kettunen, 2018) as well as business intelligence systems that provide them with insight into global markets (Li & Lakzi, 2021). Hence, when a company strategically aims to expand globally, this may incur extra IT costs that are different from the continual maintenance of global systems addressed by H4. We therefore argue that it is not only the actual degree of globalization impacts a company’s IT budget, but also that a planned globalization increase that will manifest itself in higher IT budgets. Due to these reasons, we posit:

**H5: Globalization increase is positively associated with the IT budget level.**

*The higher is the globalization increase, the higher is the IT budget level.*

In addition to the hypothesized five structural characteristics, our research model (cf. Figure 1) also accounts for other influences by controlling for the size of the firms’ IT units, their IT intensity, customer focus, industry, and the year of measurement. We also control for the country in which the data was collected to account for potential geo-economic biases and make the findings from our cross-country dataset internationally applicable.

**Methods**

We tested our research hypotheses with data from a cross-country survey using OLS regression methods.
**Data Sources and Preparation**

Raw data was obtained from the Business and Information Technologies (BIT) survey network. The BIT survey was initiated after the turn of the new millennium by researchers at UCLA Anderson and partnering institutions as a global study of the changes in business practices driven by IT (Mangal & Karmarkar, 2012). The standardized survey instrument contained a broad set of questions intended to track the adoption and outcomes of the organizational use of information technology. The primary group of respondents were the Chief Information Officers (CIOs) and managers in similar IT leadership positions in their respective organizations. Between 2004 and 2011, a total of ten surveys had been conducted by participating researchers in eight countries. While this data was acquired more than ten years ago, the research team obtained a unique access to this data only recently. We will discuss to which extent our insights from this data can still be of relevance in today’s times of digitalization.

Although the BIT surveys used a standardized instrument, the local data collections employed different survey administration methods (e.g., mail, online, and phone) resulting in different levels of data quality and completeness. We first had to engage in a several steps of data preparation and validation. The unprocessed dataset consisted of 3600 entries. First, all entries with a missing value for the IT budget variable were removed. After that, we built our relative measure for the IT budget level. The IT budget was asked to be stated as a percentage of the annual sales in the surveys. Several respondents (498), however, erroneously stated the IT budget as an absolute number. We divided the respective IT budgets by the annual sales included in the survey and checked the result for plausibility. Some implausible entries with IT budget values smaller than or equal to zero and above 100 had to be removed. Since the relative IT budget level has a right-skewed distribution that would produce non-normally distributed residuals in an OLS regression, we calculated the logarithm of the relative IT budget value. Finally, we removed outliers from the log-transformed IT budget level by applying the 1.5 IQR rule (Zhao et al., 2013).

In the next step, we replaced missing values where reasonably possible. For some of the items, we used the logical default of the respective ordinal scale. For example, if it was asked to what extent the respondent agrees or disagrees to a certain statement, the logical default would be neutral in the middle of the scale. For the industry classification, we transformed classifications other than the requested SIC codes and textual descriptions into the eight top-level groups of SIC codes and filled complete missing values using a multinomial regression model based on industry dichotomy questions. All data preprocessing, imputation, and statistical analyses were performed in Python using statsmodels, scikit-learn and other packages.

The final dataset consisted of 1652 entries from 8 different countries with observations at 15 different points in time. To prepare for the OLS regression, we transformed the categorical country and industry values to dummy variables (country reference category: USA; industry reference category: Public Administration). The year values (2004-2011) were re-scaled from 0-7 to avoid skewed coefficients in the regression model. Table 2 shows an overview of the resulting country datasets included in our analysis after preprocessing.

<table>
<thead>
<tr>
<th>Country</th>
<th>Chile</th>
<th>Columbia</th>
<th>Germany</th>
<th>India</th>
<th>Korea</th>
<th>Spain</th>
<th>Taiwan</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samples</td>
<td>211</td>
<td>106</td>
<td>201</td>
<td>110</td>
<td>220</td>
<td>348</td>
<td>365</td>
<td>91</td>
</tr>
</tbody>
</table>

Table 2. Overview of country samples

**Construct Operationalization**

Since the standardized BIT survey was designed to assess a broad set of IT and organization-related issues, rather than measuring psychometrically validated research constructs, we engaged in substantial data exploration efforts to identify factors that would fit our theoretical model. Specifically, we conducted explorative factor analyses (EFA) using a principal component analysis (PCA) as the extraction method and varimax as the rotation method to identify clear-cut factors in the question blocks of the survey. Only items with loadings above 0.6 on one factor and less than 0.3 on other factors were considered for the further analysis. Similar thresholds have been used by previous research (Chin et al., 1997; Wulf et al., 2015). As a result of this procedure, we operationalized the organization structure constructs as follows, see Table 3.
The **IT outsourcing degree** was measured through 5 items that capture the extent to which several IT sub-functions are sourced out by a company (cf. Table 3). Analogously, the **business process outsourcing degree** was measured through 3 items describing the extent to which different business processes are sourced out (cf. Table 3). The **control span increase** of firms was measured by two items, describing the span of control increase as such and whether an organizational structure is becoming flatter (cf. Table 3). We argue these items as reflective indicators, since they measure a similar matter and the question outcomes are caused by the underlying constructs (MacKenzie et al., 2011).

The globalization degree of a given company can be thought of as its spread across the globe (Asmussen et al., 2007). Thus, we measured the **globalization degree** and the **globalization increase** as composites, where each of 10 global regions (cf. Table 3) is a formative indicator. Globalization degree items asked whether a company already operates in a certain region (binary scale: yes/no) while the globalization increase items...
asked whether a company is planning to expand to a new global region in the coming three years (same scale). These items are formative indicators since the regions a company operates in, and plans to expand to, collectively determine the company’s globalization degree and globalization increase, respectively (MacKenzie et al., 2011). The scores for these two composites were calculated from a PCA following Petter et al. (2007) who suggest using “principal components analysis (rather than common factor analysis) to examine the item weightings for measures” (p. 642) in order to validate formative constructs.

In terms of control variables, IT unit size was measured by the log-transformed number of IT employees. IT intensity was measured as a count of information technologies adopted by the firm. Customer focus refers to the degree to which a company employs technology-mediated channels to communicate with their customers and was measured as composite of six possible channels (binary scale: have / not have). The industry was measured by the eight top-level groups of the SIC codes and used in dummy coded format. The year of the respective survey was stated by an integer scaled to 0−7. And lastly, the country of a firm was stated as a categorical symbol and coded as nine dummies.

Table 3 provides an overview of the research constructs used in this study, including their description, their items, and their scale levels. Table 4 shows the loadings and weights of the reflective and formative indicators for their respective constructs (only hypothesized constructs are shown).

Table 4. Loadings and weights of constructs

<table>
<thead>
<tr>
<th>Question item</th>
<th>Weights of formative indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming</td>
<td></td>
</tr>
<tr>
<td>Data center operations</td>
<td>USA</td>
</tr>
<tr>
<td>Network management</td>
<td>Latin America</td>
</tr>
<tr>
<td>Data management</td>
<td>Western Europe</td>
</tr>
<tr>
<td>Customer IT support</td>
<td>Central/Eastern Europe</td>
</tr>
<tr>
<td>Accounting</td>
<td>Africa</td>
</tr>
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<td>Finance</td>
<td>Middle East</td>
</tr>
<tr>
<td>Order fulfillment</td>
<td>SE Asia</td>
</tr>
<tr>
<td>Increasing control span</td>
<td>South Asia</td>
</tr>
<tr>
<td>Flattening of structure</td>
<td>East Asia</td>
</tr>
</tbody>
</table>

To test our stated hypotheses, we estimated the following model (including transformations):

$$
\log (IT \text{ budget level}) = \beta_0 + \beta_1 * \text{ITO degree} + \beta_2 * \text{BPO degree} + \beta_3 * \text{Control span increase} + \beta_4 * \text{Globalization degree} + \beta_5 * \text{Globalization increase} + \beta_6 * \log (IT \text{ unit size}) + \beta_7 * \text{IT intensity} + \beta_8 * \text{Customer focus} + \sum_{i=0}^{8} \beta_{i} * \text{Industry}_i + \beta_{17} * (\text{Year} - 2004) + \sum_{j=0}^{8} \beta_{18+j} * \text{Country}_j + \beta_{j} * + \varepsilon
$$

**Results**

We first describe the sample characteristics and analytically establish the validity of our measures before we present the hypotheses test results.

**Measurement Validity**

Table 5 shows the descriptive statistics of all model variables excluding categorical variables (industry and country) along with quality indicators and cross-correlations. On average, the companies of our sample allocated 6.51 percent of their annual sales for their IT budgets and had 50.8 IT employees. Internal consistency of the factors with reflective indicators (ITO degree, BPO degree, control span increase) is supported by sufficient levels of composite reliability (cr > 0.70) (Hair et al., 2011).

For the composites with formative indicators (globalization degree, globalization increase, customer focus) variance inflation factor (VIF) values are far below the common threshold of 10 (Belsley et al., 1980), indicating no issues with multicollinearity between their indicators (cf. Table 5). As some variables are highly correlated (cf. Table 5), we also computed the VIF on a model level. The highest VIF score in the non-categorical variables is 2.16 (ITO), hence, multicollinearity does not seem to be an issue on the model level.
Hypotheses Tests

Table 6 shows the results of our OLS regression model using a simplified notation for the categorical variables industry and country. Hypotheses were tested for significance at the p<.05 level based on one-tailed tests.

Our data supports the hypothesis that the IT outsourcing degree is associated with the IT budget level (H1). The higher the IT sourcing degree, the lower the IT budget and vice versa (β = -.139; p < .010); H1 is supported. The business process outsourcing degree is also associated with the IT budget level, yet—as hypothesized (H2)—in the opposite direction. The higher the business process outsourcing degree, the higher is the IT budget (β = .150; p < .010); H2 is supported, too.

Our data further confirms that a control span increase is positively associated with the IT budget level (H3). This means that flattening organizations have a higher IT budget, while organizations becoming steeper in terms of hierarchy have a lower IT budget (β = .067; p < .050); H3 is supported.

We find no support for the globalization degree being associated with the IT budget level (H4). The coefficient is close to zero and not in the hypothesized direction (β = -.043; p < .20); H4 is not supported. We do find support, however, for the association of globalization increase with the IT budget level (H5). The higher the planned globalization increase of a firm, the higher is its IT budget. This variable has the strongest effect of all hypothesized associations (β = .256; p < .010); H5 is supported.

The control variables in our model are partially significant. IT unit size exhibits a positive coefficient and is significant, indicating that firms with more IT employees tend to have higher relative IT budget levels. The IT intensity of a firm is positively but not significantly related to the IT budget, corroborating that increased technology adoption may drive IT budgets up. Interestingly, the customer focus is negatively and significantly related, suggesting that firms with more technology-mediated customer interfaces actually tend to have lower IT budgets. Most of the industry dummies are not significant in our sample except Mining (negative effect). The year of measurement has a negative coefficient and is significant as well, indicating that IT budget levels generally decreased in the observation period. The country coefficients show a heterogeneous distribution with three country dummies being significantly related to the IT budget level, indicating that the country a firm has its headquarters in can be a significant influence for its IT budget level.

The R² of our model is 20.40% (adjusted R²: 19.20%), which is similar to models from previous research that did not include the IT budget of the previous year as an explanatory variable (Kobelsky et al., 2002, 2008). This relatively small R² score indicates that structural factors itself explain only some portion of the IT budget level of a firm and that other factors outside our nomological model influence the IT budget as well.
### Discussion

This research built on the idea that the structural dimensions of organizations, including their specialization, the hierarchy of authority, and centralization, are potentially relevant determinants of the IT budget level, beyond the already known technology and industry contingencies. With this, we followed a longstanding, yet unaddressed call by Dewan et al. (1998) to investigate the relation between the internal organization of the firm and IT-related indicators. We drew on organization design theory (Daft, 2012; Mintzberg, 1980) and auxiliary perspectives to derive two constructs for the specialization dimension (IT outsourcing degree, business process outsourcing degree), one construct for the hierarchy of authority (control span increase), and two constructs capturing spatial decentralization of a firm (globalization degree, globalization increase). We hypothesized associations of these five constructs with the IT budget level and tested our hypotheses with carefully preprocessed data from a multi-country, multi-year dataset obtained from the global BIT network (Mangal & Karmarkar, 2012). Our research model additionally controlled for some of the technology and industry characteristics that have been the focus of prior research, next to other potential biases inherent to our method.

Our finding that four of the five constructs are significantly related to the IT budget level is, first of all, an extension of the sparse string of IS financial research. Our results provide new insights into the structural organization characteristics that co-determine IT budget levels. With this, we extend the literature that focuses on the upstream determinants of IT financials (e.g., Dewan et al., 1998; Kobelsky et al., 2008; Kobelsky & Robinson, 2010). Although our data is only slightly more recent than the data in comparative studies in this string of research (cf. Table 1), we believe our research makes a case for why structural characteristics of organizations should generally be taken into account when determining IT budgets levels. Under the assumption that the demonstrated relationships still hold in times of digitalization, we discuss the contributions of this research to the auxiliary literatures in the following.

In terms of firm specialization, our twofold findings regarding the degree of IT outsourcing (H1) vis-à-vis business process outsourcing (H2) contribute to the literature on outsourcing in IS. The outsourcing literature has primarily focused on the decision for, and the outcomes of, outsourcing (Lacity et al., 2010). Although the desire for cost reduction has repeatedly been reported as the primary motive for IT outsourcing, there is surprisingly little evidence on whether such cost saving outcomes are actually achieved and thus reflected in IT budgets (ibid). The cost saving effects of IT outsourcing have, in fact, remained controversial in the academic and practitioner literature (Barthélémy, 2001; Ho & Atkins, 2010; Koh et al., 2004). Kobelsky and Robinson (2010), who hypothesized that IT outsourcing leads to lower IT spendings, found the opposite and concluded that IT outsourcing is primarily used for enhancing IT capabilities. In contrast to Kobelsky and Robinson (2010), our findings suggest that a greater degree of IT outsourcing, at

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<table>
<thead>
<tr>
<th>Hyp.</th>
<th>Variable</th>
<th>β-coefficient</th>
<th>Std. Error</th>
<th>t-value</th>
<th>p-value</th>
<th>Result</th>
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<tr>
<td></td>
<td>Const</td>
<td>-.068</td>
<td>.661</td>
<td>-.103</td>
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<td>H1</td>
<td>IT outsourcing degree</td>
<td>-.139</td>
<td>.052</td>
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<td>Sup.</td>
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<td>Control span increase</td>
<td>.067</td>
<td>.037</td>
<td>1.80</td>
<td>.036*</td>
<td>Sup.</td>
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<td>H5</td>
<td>Globalization increase</td>
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<td>2.93</td>
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<td>Sup.</td>
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<td></td>
<td>IT unit size</td>
<td>.162</td>
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<td>5.69</td>
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<td>-</td>
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<tr>
<td></td>
<td>IT intensity</td>
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<td>.011</td>
<td>1.18</td>
<td>.119</td>
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</tr>
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<td></td>
<td>Customer focus</td>
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<td>.056</td>
<td>-3.94</td>
<td>.000*</td>
<td>-</td>
</tr>
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</tr>
<tr>
<td></td>
<td>Year</td>
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<td>.025</td>
<td>-4.16</td>
<td>.000*</td>
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<td>Country</td>
<td>Chile (-), Columbia (+)<em>, Germany (-), Korea (+)</em>, India (-), Spain (+), Taiwan (-)*</td>
<td>-</td>
<td></td>
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</tr>
</tbody>
</table>

R² = .204
Adjusted R² = .192
N = 1652

* = significant at p < .05; for categorical variables: (+) = positive coefficient, (-) = negative coefficient

Table 6. OLS regression results
large, goes along with lower IT budget levels (H1). Hence, it supports the view that long-term IT efficiency gains have been realized after outsourcing. A possible explanation for the deviation from the results of Kobelsky and Robinson (2010) could be the different time of measurement. As our data was collected at a later period of time, firms may have experienced a learning curve on how to outsource IT more successfully.

Our support for the hypothesis that business process outsourcing is associated with IT budget levels (H2) taps into new territory of outsourcing research in IS. The majority of works that addressed the outsourcing of entire business processes have remained tacit regarding the financial implications of business process outsourcing for IT (Lacity et al., 2011). Bardhan et al. (2006), who investigated the effect of IT investments on the outsourcing of production processes, found a positive relationship, arguing that high IT investments enable firms to outsource business processes. Our causal reasoning was reverse, since we hypothesized that business process outsourcing may lead to cost increments for providing and running underlying inter-organizational information systems that integrate company operations with their business process outsourcing partners. However, our measured (positive) association between BP outsourcing and IT budgets is consistent with Bardhan et al.’s (2006) findings. Further, our reasoning is also consonant with Dewan et al. (1998) who concluded that less vertical integration of a firm requires more external coordination and thus leads to higher IT investments since IT is used for communication and exchange with other value chain participants. Together, our findings regarding the specialization dimension add to the outsourcing literature in IS by highlighting the distinct IT budget implications of IT outsourcing and business process outsourcing.

Our finding regarding the hierarchy of authority dimension (H3) can be seen as a contribution to IT governance research in IS. Prior research has produced inconsistent results regarding the relationship between decision making structures and investment in information systems (e.g., Hitt and Brynjolfsson, 1997; Lee and Grover, 1999). We found empirical support for our argument that an organization’s tendency towards a widening span of managerial control is significantly related to increasing IT budget levels due to some companies’ desire to prioritize IT innovation over efficiency (Georgsdottir & Getz, 2004). However, while prior IT governance literature has widely argued for the correlation of decentralized governance with greater responsiveness and innovation goals, there has been a lack of evidence of whether such goals also actually translate into higher IT budget levels. Our H3 finding therefore substantiates that greater innovation through decision rights decentralization seems to have its ‘price tag’ in terms of higher IT budget levels.

The third organization design dimension employed in this research was (de)centralization. Two facets of centralization were assessed, the spatial globalization degree and the planned geographical expansion. Here our nuanced findings imply that it is not the degree of global operations per se that drives relative IT budget levels (H4 not supported), but the strategic intent to drive globalization forward that leads firms to make higher investments in IT (H5 supported). Companies face IT budget surpluses for each additional global region that they enter. The finding regarding H5 is a contribution to the strategic management literature that has focused on firm resources required for global market expansion. This literature lacks an understanding of the crucial role of information technology resources for globalization (Karimi et al., 1996; Karimi & Konsynski, 1991). Few recent works in IS have advanced the literature by highlighting the role of backbone systems and market analytics in preparing a successful global market entry (Li & Lakzi, 2021; Uwizeyemungu et al., 2018). Our novel contribution is to provide evidence that technology investments for global expansions are actually reflected in increased IT budget levels. Taking our findings on the (de)centralization dimension (H4 and H5) together, our results suggest that, once IT investments for the expansion are made, globally operating firms gain additional efficiency in IT and manage to revert to normal IT budget levels. In other words, it is not about being global, but about going global what drives IT budgets up.

**Practical Implications**

The key practical implication of this research is that executive boards need to take into account their specific firm structure when making strategic decisions about their IT budget levels, all the more in the era of globalization and digitalization. Our results might be of particular interest for IT consultancy firms that advise companies in benchmarking and determining their IT budget levels (e.g., Gartner, McKinsey, Accenture). While such benchmarking approaches typically consider size and industry influences, our work provides that degrees of outsourcing, hierarchy, and globalization are additionally relevant influences that
co-determine industry-typical IT budget levels.—Whether such refined benchmarks are then considered to be adequate for the specific company is another question that CIOs and their boards need to tackle.

**Limitations and Future Work**

The following limitations merit consideration. First, due to the collection methods of the BIT survey, data quality for some of the variables (industry) was moderate, which may have influenced the few significant findings regarding this control variable. Second, since our data is from a 2004–2011 timeframe, IT budget levels and their relative structural influences may have changed until today. For example, the increased sourcing of services from cloud vendors, which are contracted directly from business departments, may alter the influence of the IT outsourcing level on IT budgets. Third, although our data stems from different socio-economic geographies that we controlled for through country dummies, generalizations still need to be made with care since our data cannot necessarily be regarded as a globally representative sample. Lastly, our statistical analyses only ascertain association, not the causation inherent in our theoretical arguments. Future work can extend the sparse string of IS financial research in multiple compelling directions. For example, authors might want to collect more recent data to track how IT budget and spending levels have changed in times of digitalization. Especially fruitful would be research designed to unveil the under-researched discrepancies between planned IT budgets and actual IT spending. In this context, research also needs to take into account the hard-to-measure budgets for ‘shadow IT’ and ‘business-managed IT’ run in and paid for by business departments. Another promising area for IS financial research could be to correlate IT budgets with the ‘technical debt’ that companies accumulate at the cost of keeping their IT assets up to date. IT business value research in IS has predominantly used a ‘soft’ understanding (and accordingly latent measures) of IT value and its antecedents. Overall, we believe that this soft perspective can be strengthened by more research on hard measures of popular management ratios such as IT budgets, IT investment, and IT spending levels, all of which are of high relevance to practice still today.

**Conclusion**

Motivated by the idea that organization structure is an under-researched co-determinant of key IS financial ratios, this research investigated the relationships between facets of specialization, hierarchy, and centralization aspects and the relative IT budget level of the firm. Comprehensive data from a cross-country survey provide evidence for our theoretical arguments that IT outsourcing decreases IT budgets, while business process outsourcing, control span increases, and global expansions increase IT budget levels. Our findings contribute to the outsourcing, IT governance, and strategic management literatures by highlighting the explanatory value of the established, but underappreciated organization design theory dimensions for determining key managerial variables such as the IT budget level. The key practical implication of this research is that companies need to take into account the idiosyncratic structural characteristics of their organization when determining their IT budget levels. We hope that future research can build on our organization design theory perspective to strengthen the fine but important line of financial research in IS.

**References**


Organization Structure Determinants of IT Budgets


Organization Structure Determinants of IT Budgets


