Successful project portfolio management beyond project selection techniques: Understanding the role of structural alignment

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Abstract

Project portfolio management (PPM) is a commonly employed technique to align a project portfolio with strategic goals. Prior research has mainly regarded PPM as a methodology to optimize the overall benefit of a project portfolio. While adequate project selection techniques are certainly important, we argue that successful PPM – and consequently effective strategy implementation – depends on an organization’s structural alignment with the needs of PPM. Based on three cases in the German construction industry, we study the effects of fundamental strategic changes on the project selection and organizational structure. From our case analysis, we develop a substantive theory to explain how the criteria, used by a company to choose and evaluate its projects, influence the company’s structure through the information requirements created by such criteria. To assess whether our theory is in line with accepted schools of thought on organizational design, we integrate it with existing organizational theories. Our contribution is twofold. First, we offer a substantive theory that integrates strategy implementation, organizational information processing, and structural adaptation. Second, we introduce a new antecedent of successful PPM, namely structural alignment, thus introducing a new perspective on PPM beyond mere project selection techniques.

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Keywords: Strategic project portfolio management; Contingency theory; Theory of organizational information processing

1. Introduction

When Philipp Holzmann AG, which had long been Germany’s largest construction company, filed for insolvency in 1999, the public was shocked. While government intervention was able to delay its eventual demise to 2002, it became apparent that, owing to a lack of communication between headquarters and business units as well as insufficient risk management, Philipp Holzmann AG had accepted risky projects far beyond its means (Dahlkamp and Reuter, 1999).

The case of Philipp Holzmann AG shows that selecting the right projects is crucial for the success of project-based business models (Müller et al., 2008). Available project alternatives usually far exceed the number of projects that can be executed with an organization’s limited resources at any given time, and choosing the right projects in a particular context is seldom easy (Engwall and Jerbrant, 2003). Therefore, academics and practitioners alike have sought to develop methods to address the project selection problem. One prominent approach is project portfolio management (PPM), which is used to keep the ratio between existing and new projects as close to an optimal state as possible (Archer and Ghasemzadeh, 1999). While financial criteria play a significant role in defining the optimal state, strategic intentions are also important (Englund and Graham, 1999). The strategic aspect of
project portfolio management has seen increasing interest in research, and there is now ample literature on the connections between project portfolios and business strategies (Artto, 2001; Morris and Jamieson, 2005).

However, most literature takes a somewhat methodological perspective on PPM, focusing on algorithms for optimizing portfolios and the general effectiveness of PPM approaches (e.g., Doerner et al., 2006; Henriksen and Traynor, 1999). PPM is seen as a planning and controlling approach looked after mostly by project management offices or dedicated role-players in the project organization (e.g., Archer and Ghasemzadeh, 1999; Müller et al., 2008). However, while this perspective has seen much attention, we are not aware of any research into the organizational transformations necessary to implement a strategic project portfolio management regime. This is unfortunate, because organizational alignment and the ability to collect pertinent information from all organizational units is often more important to PPM success than employing sophisticated project prioritization methods or information systems (Kerzner, 2004). Indeed, the lack of research into the organizational impact of strategy implementation is not limited to project-based organizations but is a general blind spot in strategy research (Noble, 1999), even though practitioners often see strategy implementation as more risky and difficult than strategy formulation (Hrebiniak, 2006).

In our research, we study organizational alignment as an antecedent to successful PPM, using case studies in the German construction industry. Construction contractors are a typical example of project-based companies. Since their core business is the execution of construction projects, strategies must be implemented by changing how projects are selected and managed (Langford and Male, 2001). From the empirical data we gathered at three large construction firms, we derive a substantive theory of the relationships between strategy, project portfolio management, and the organizational alignment prompted by strategic PPM implementation. The resulting theory will be integrated with theories of organizational information processing (Galbraith, 1973) and contingency theory (Donaldson, 2006; Hofer, 1975) to interpret the results in the context of a more general theoretical framework.

The paper is structured as follows. After the Introduction, we examine the state of strategic management with a focus on the construction industry and also provide an overview of the concept of project portfolio management. We then present our research method. We illustrate our findings in the context of a short description of the current state of German construction. In the next section, we explain the substantive theory we have developed and embed it in broader theories of strategic alignment. In conclusion, we point out our study’s limitations and outline future research opportunities.

2. The rise of strategic management in construction

The topic of strategic management is rarely considered in literature about project portfolio management. Strategy is often considered the preserve of top management, while project management issues are the responsibility of the project management office. This view fails to acknowledge the close relationships between both fields, particularly in project-based businesses. On the one hand, a functioning strategic management process is a precondition for the alignment of a project portfolio with strategy (Meskendahl, 2010). On the other hand, project portfolio management is essential for the implementation of formulated strategies in these firms (Srivannaboon, 2006). As an antecedent of PPM, we will discuss the state of strategic management in the construction industry as it is documented in the literature in some detail. This will also illustrate in what context the case companies we studied operate.

While strategic management is generally studied in the abstract, and without reference to any one industry, some specificities of construction warrant the consideration of strategy implementation in this industry. More than most other manufacturing industries, construction has traditionally been a laggard in adopting strategic management methods (Hillebrandt et al., 1995; Junnonen, 1998). Several reasons have been put forward for this slow adoption. First, construction contractors’ project-based business model is certainly an important obstacle: not having one relatively static organization but a plethora of temporary organizations (i.e. individual projects) inhibits the implementation of complex strategies (Chinowsky and Meredith, 2000). The dominance of small to medium-sized, owner-run firms in construction might also contribute to the slow uptake of strategic management practices, as these firms have been shown to be less conscious of strategy and more concerned with short-term management (Jennings and Beaver, 1997). Finally, it has been suggested that the educational backgrounds of construction firms’ top managers lead to low awareness of strategic management. Since many construction managers have an engineering background, many lack formal training in strategy formulation and implementation methods (Pries and Janssen, 1995).

Despite lagging acceptance in construction, there is now a growing body of research on construction strategy (see Table 1). Prior research primarily reveals a slow increase in awareness of strategic management methods over the past two decades. While the strategy formulation aspect has received some attention, strategy implementation in the construction industry is still poorly researched. This leaves a gap in current research, because strategy implementation is far more industry-dependent than strategy formulation (Gupta and Govindarajan, 1984).

3. The concept of project portfolio management

Project management is linked to strategy implementation in two distinct ways. Firstly, there is the management of strategy implementation projects, an aspect that has been studied extensively (Grundy, 2000; McElroy, 1996; Pellegrinelli and Bowman, 1994). The second link is the implementation of a strategy through the modification of project management (PM) practices (Srivannaboon, 2006). This applies to all facets of single-project and multi-project management, specifically in project-based industries where projects are of paramount strategic relevance.
Table 1
Overview of previous strategy research in the construction industry.

<table>
<thead>
<tr>
<th>Article</th>
<th>Overview</th>
<th>Pertinent contribution</th>
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<tbody>
<tr>
<td>Lansley (1987)</td>
<td>Lansley develops an explanatory framework linking the strategy, skills set, and structure of construction firms with the market environment.</td>
<td>Based on contingency theory, the paper introduces the notion of adaptive responses of construction firms to changing market conditions.</td>
</tr>
<tr>
<td>Betts and Ofori (1992)</td>
<td>After outlining Porter’s five forces, value chain, and generic competitive strategies as strategic management paradigms, the paper focuses on factors inhibiting the application of such paradigms in construction.</td>
<td>Betts et al. identify the following hindrances to strategic management in construction: - Uniqueness of individual projects. - Industry fragmentation. - Management intensity (leaving less time for strategic management).</td>
</tr>
<tr>
<td>Warszawski et al. (2007)</td>
<td>Warszawski presents a process for strategy formulation in the construction industry.</td>
<td>It is necessary to focus on both the business environment and the internal resources of a company to select successful strategies.</td>
</tr>
<tr>
<td>Junnonen (1998)</td>
<td>Junnonen studies the strategy formation process in construction firms. The paper distinguishes between the formation of a long-term corporate strategy and business strategy with a narrower focus on shorter-term changes.</td>
<td>Junnonen underlines the challenges to strategic construction managers by the industry’s cyclical nature.</td>
</tr>
<tr>
<td>Chinowsky and Meredith (2000)</td>
<td>The authors conducted a survey of executives at the 400 largest general construction contractors with regard to the state of strategy planning and competence development.</td>
<td>The survey shows that construction executives are aware of the importance of strategic market positioning in a highly competitive environment. However, strategy planning is still only partly implemented in most companies.</td>
</tr>
<tr>
<td>De Haan et al. (2002)</td>
<td>De Haan et al. assess the validity of the core competence theory of strategy in the construction theory.</td>
<td>Core competencies are found to be a valid approach to strategies in construction. The authors hold that a fit between the market environment and a firm’s capabilities are critical for its success.</td>
</tr>
<tr>
<td>Price (2003)</td>
<td>Price presents a comprehensive overview of the strategy process in construction. Frameworks found in practice are combined into a unified framework for the construction industry.</td>
<td>The studied organizations show the growing sophistication of construction companies with regard to strategic management. However, it becomes apparent that many companies are still unable to effectively implement strategies.</td>
</tr>
<tr>
<td>Green et al. (2008)</td>
<td>Green et al. investigate the applicability of the dynamic capabilities theory to construction. Since dynamic capabilities – like core competencies – are grounded in the resource-based view of the firm, the study is closely related to the one by De Haan et al. (2002).</td>
<td>The authors find dynamic capabilities to be a fitting theoretical approach to strategy formation. They establish that construction firms derive their strategy largely from their own expertise in transforming resources into business value.</td>
</tr>
<tr>
<td>Kazaz and Ulubeyli (2009)</td>
<td>Exploring strategic management practices, Kazaz et al. surveyed firms to create a SWOT analysis for the Turkish construction industry.</td>
<td>The research showed an increasing use of strategic management techniques. However, many companies still consider long-term planning and conscious market positioning to be tedious and unnecessary. The statistical model shows a strong impact of strategic decisions as well as resources/capabilities on organizational performance. Project management competency exacts its influence mostly through its effect on these two factors.</td>
</tr>
<tr>
<td>Isik et al. (2010)</td>
<td>Isik et al. relate resources/capabilities, project management competence, and strategic decisions to company performance using a structural equation model.</td>
<td></td>
</tr>
</tbody>
</table>

Project portfolio management has risen to prominence as a method of selecting and managing an organization’s projects (Thiry and Deguire, 2007). As the name suggests, PPM has its origins in the application of modern portfolio theory to the project selection problem. First put forward in the seminal work of Markowitz (1952, 1991), modern portfolio theory was originally applied to financial asset selection into an optimal portfolio, but the general applicability of ideas from portfolio theory to project selection has long been established (Gibson and Nolan, 1974). PPM is now used for the composition of project portfolios in such diverse fields as product development (Cooper et al., 2001), IT (McFarlan, 1981), and construction (Vergara and Boyer, 1977). While in its inception, PPM primarily meant the selection of projects using the original portfolio theory factors of risk and return, it now refers to a broader set of activities (e.g., continuous risk management, controlling, and reporting), and considers a wider range of factors (Blichfeldt and Eskerod, 2008). A portfolio is different from a program or large-scale projects with subprojects in that its projects need not have a shared goal, but simply compete for the same resources (Turner, 2009).

The typical activities in PPM’s scope are the gathering of possible projects, their prioritization and selection according to...
available resources, and the evaluation of running projects concerning their continuing fit with the portfolio. These activities usually involve particular optimization algorithms or management techniques that make use of specific project selection criteria (e.g., Doerner et al., 2006; Henriksen and Traynor, 1999; Kavadias and Loch, 2003). Companies have considerable leeway in the development of their selection criteria, and different measures as well as the wide variety of industries, project types, and strategy choices make interorganizational standardization impractical (Hall and Nauda, 1990; Krumm and Rolle, 1992). However, it has been well established that project selection guidelines are the single most important mediator in the alignment of project portfolios to strategies, and therefore deserve the attention of practitioners and scholars (Arto and Dietrich, 2004; Cooper et al., 2001; Crawford et al., 2006; Dye and Pennypacker, 1999; Englund and Graham, 1999).

Yet, a project does not leave the project portfolio management’s scope after it is selected for execution. Even though often neglected, the continuous evaluation of running projects, using the same criteria as for their selection, is paramount for stringent PPM (Jeffery and Leliveld, 2004). The unique nature of individual projects makes predictions about their progress very difficult and therefore imprecise. If an organization intends to keep a project portfolio in a certain state, it is not sufficient to consider the proposal stage estimates; instead, one should rather work with measures that reflect current project statuses. For instance, if a project’s risk profile (budget, resource demands, etc.) changes after its initiation, the portfolio profile and therefore the selection of future project – accordingly – needs to reflect this change (Engwall and Jerbrant, 2003). The initial and continuous evaluation of the projects in a portfolio creates a high demand for high-quality, up-to-date internal and external information, which can put considerable strain on an organization; this is put forward as the main reason for the inattentiveness to this aspect of PPM in many organizations (Kendall and Rollins, 2003).

4. Research method

As noted, our goal was to create a substantive theory of structural alignment to the strategic project portfolio management implementation. To get a rich picture of this link, we employed a qualitative research method. We used a multi-case study approach following general guidelines proposed by Yin (2008) and Eisenhardt (1989). To aid our theory-building, we also relied on the principles of grounded theory, as introduced by Glaser and Strauss (1967) and further specified by Strauss and Corbin (1990).

4.1. Site selection

Since we are still in the phase of building rather than testing our theory, we used a theoretical sampling approach, looking for sites that appeared well suited to reveal the relationships we sought to explore (Charmaz, 2006). Thus, even though the construction sector is dominated by smaller firms (DESTATIS, 2010), we wanted to ensure the presence of a comprehensive set of institutionalized project portfolio management practices as well as a sophisticated strategy process and therefore focused on large construction companies. As an additional criterion and in order to get easier access to information about the companies’ strategic positions and outlooks, we selected publicly traded companies that regularly disclose their high-level strategies in their annual reports and other investor relations documents.

4.2. Case companies

We collected data at three of Germany’s largest construction companies. While similar in size, they were sufficiently diverse in their backgrounds, market positions, and strategic positions to get a broad view on construction industry practices. Table 2 provides an overview of the case companies and their main fields of activity. As is clear from the firms’ activities, they are already fairly diversified and derive a substantial part of their revenues from real estate related activities other than building. The difference in revenue per employee shows the different degrees of vertical integration. Beta in particular exhibits a very low degree of vertical integration, generating approximately twice the revenue per employee as Alpha. Gamma is more specialized than the other two, focusing on the construction of traffic routes, i.e. mainly streets and canals. All three companies do more business abroad than in their home market (Germany). For Beta, Germany is only the second-largest single market by revenue, because the U.S. and the Asia Pacific region generated almost half of its revenue.

<table>
<thead>
<tr>
<th>Case company overview.</th>
<th>Alpha</th>
<th>Beta</th>
<th>Gamma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees (in thousands)</td>
<td>67.4</td>
<td>66.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Revenue (in billion Euros)</td>
<td>10.4</td>
<td>20.7</td>
<td>4.0</td>
</tr>
<tr>
<td>National revenue share</td>
<td>32%</td>
<td>11%</td>
<td>48%</td>
</tr>
<tr>
<td>Main fields of activity</td>
<td>Construction engineering, building above and below ground, real estate and industrial related services, concession projects.</td>
<td>Real estate development, building above and below ground, real estate and industrial services, concession projects.</td>
<td>Focus on traffic route engineering, but also building above ground and construction engineering, real estate related services, concessions.</td>
</tr>
</tbody>
</table>

Table 2

4.3. Data collection

We used two main data sources to build our cases and analyze the case companies’ strategies, project portfolio management, and organizational structures. The first source was interviews with informants in each company’s project management organizations and senior management (Kumar et al., 1993).

The interviews took place between November 2008 and November 2009. We used a semi-structured interview approach, using an interview guide that contained a broad set of questions concerning project management governance and processes. This interview guide served two purposes: First, we sent it to prospective interviewees to provide them with an overview of the study as well as their role as participants. Besides the guide, the interviewees were also briefed on issues of anonymity and the use of the data so as to obtain their informed consent (Kvale, 1996). Second, the guide supported the interviews, ensuring proper coverage of all relevant topics with all informants, and refocusing the conversation if the interviewee digressed. In the guide, we sought a balance between overly narrow questions (which often introduce preconceptions and lead to sparse data) and a guide that is too general (to be of any help to the interviewer or the interviewee) (Glaser, 1998, p. 94).

In accordance with Charmaz (2006, p. 18), we created a framework of questions to choose from in response to the topics already covered in the interviewees’ answers and the state of the built theory. The interviewers were also free to explore interesting points brought up by the informants with follow-up questions. The interviews were always led by two interviewers to reduce any bias, ensure comprehensiveness, and increase the field notes’ validity. All interviews were recorded and then transcribed to a verbatim report for analysis (Bechhofer, 1984; Eisenhardt and Bourgeois, 1988). We collected 166 pages of interview transcripts from interviews with two to five key informants in every organization. We also asked interviewees for interview transcripts from interviews with two to five key informants in every organization. We also asked interviewees for documents describing their project management and PPM practices and organization. Interviewees from Alpha and Gamma granted us access to such documents, which were added to the case material for further triangulation (Eisenhardt, 1989).

The interviewees were selected for their in-depth knowledge of their companies’ project management processes and their experience in this context. All interviewees had been at their firms for at least five years, some for more than 40 years. At company Alpha, we spoke to a senior project manager from the Russian subsidiary and the head of project management and scheduling. At Beta, we were able to speak to the department heads of competence management, development and building process management, and three senior project managers. At Gamma, we interviewed the head of scheduling and project management, the head of internal services, and a senior project manager. Due to their strong involvement in the conception and implementation of project management practices and their long careers in their organizations, the interviewees were not only able to elaborate on the status quo but also the longitudinal dimension of the development of project management in their firms.

The second primary data source was the annual reports that the case organizations are obliged to publish as publicly traded companies. As part of the official investor information, they must include sections detailing the current situation and risks for the business, as seen by senior management. While not strictly required by law, these reports also customarily contain elaborate sections on a company’s past, present, and future strategies. Further insights can often be gleaned from the sections describing the market situation as well as from the editorials by the CEO and board chairman. We obtained the past decade’s (2000 to 2009) annual reports for the case companies, focusing particularly on the abovementioned sections. While the reasoning employed by executive management in annual reports tends to be self-serving (Bettman and Barton, 1983), they have been shown to be a good source of information concerning an organization’s strategies (Bettman and Barton, 1983; Bowman, 1984). We collected 3513 pages of annual reports from the case companies.

As far as they were applicable, we followed the guidelines of Eisenhardt (1989) and Gribbon et al. (2008) to ensure rigor in data collection and analysis. For instance, we collected all data in a structured database, in our case, a hermeneutical unit of the ATLAS.ti qualitative analysis software version 6.2.27.

4.4. Data analysis

The source material was coded bottom-up, as recommended by Strauss and Corbin (1990), i.e. without an a priori coding scheme. In a first step, we analyzed the source documents line-by-line, marking every discernible concept with a code reflecting its content. The coding was performed by one researcher and then independently confirmed by a second; differences between the two coders were reconciled in a workshop. With the annual reports, we restricted the full analysis to the parts pertinent to a company’s past, present, and future strategy (the strategy section, forewords, editorials, and situation and market reports). The remaining parts of the reports (e.g., financial reporting, audit certificate, compensation statements) were skimmed to spot relevant sections but were not coded line-by-line. We checked the quality of the source material (in particular, annual reports vs. interview transcripts) through data triangulation and found no obvious contradictions. We therefore conclude that the interview transcripts and annual reports are trustworthy concerning the information relevant for our study.

After the coding of the documents, we performed several rounds of categorization, constantly comparing the source material with the categories to ensure category validity (Strauss, 1987). To ease this process, we employed a visual mapping technique (Miles and Huberman, 1994) using the network view functions provided by ATLAS.ti and merging the resultant codes into supercodes. The categorization was performed conjointly by two researchers in a series of workshops.

4.5. Theory-building

To arrive at our substantive theory, we used two interrelated processes: conceptualization and theoretical integration. Conceptualization is the ‘naming of an emergent social pattern
grounded in research data’ (Glaser, 2002). Through our work on the low-level concepts, we discovered and coded in the source data and these concepts’ categorization, arriving at higher-level core categories in which the gathered information could be organized; this information had meaning and validity above and beyond the various case incidents. We also contextualized the concepts in a framework that emerged from our analysis; as we condensed the data, it became clear that all events, with their antecedents and consequences, could be located in three specific conceptual realms: strategic management, project portfolio management, and organizational alignment.

For substantive theories with a focused scope, such as the one we develop in this paper, it is fruitful to explore links to other, more general or ‘grand’ theories to ensure our theory’s plausibility, connect it to existing research streams, and more easily compare the theory with findings from related fields of inquiry (Charmaz, 2006; Eisenhardt, 1989). For the purpose of this theoretical integration, we screened influential theories of organizational behavior, learning, and strategy for insights into the overarching causalities behind the phenomena we observed. In the following sections, we first describe the findings and propositions of our substantive theory and then highlight the links to existing theory.

5. Strategic challenges and structural alignment of PPM

While they disagree about the extent and causes of its influence, the proponents of both the resource-based view and the industrial organization perspective acknowledge the environment as an important determinant of successful strategies (Miller and Shamsie, 1996; Porter, 1979). Since the adaptation of strategy to the environment is important, changes in the environment often trigger adjustments in strategies (Venkatraman and Prescott, 1990). The German construction industry is thus well suited to our research objectives owing to the drastic changes that it underwent during the past decade. We were able to observe our case companies in or shortly after a strategic change process, which also led to the implementation of project portfolio management practices. By comparing organizational structures before and after these changes, we were able to infer PPM implementation’s impact on the organization. To provide some context to the companies’ strategic responses, we will describe the new environmental conditions they faced and how these were assessed by the companies’ top management.

5.1. Setting the scene: The market environment

The German construction industry has been in distress for almost 15 years. Like the construction sector in other mature economies (Ng et al., 2009), the gross value added share of construction in Germany has declined since the end of post-war reconstruction (DESTATIS, 2010). However, the downward trend in this industry only developed into a dramatic construction crisis (Baukrise) after a short boom phase in German construction spurred by government spending and tax subsidies incentivizing real estate investment in East Germany in the years after reunification (Bensemann and Kiesewetter, 2008). For about five years (1991 to 1996), the artificial demand created by these subsidies not only led to a build-up of over-capacity in the industry, but also shielded German construction contractors from rationalization pressures felt in other European markets owing to increasing internationalization and workforce mobility (Keitel, 2007). Therefore, when the subsidies ended, German contractors were forced to adapt their capacities to the lower demand and also faced fierce competition for the remaining contracts from foreign competitors entering the German market. The situation was further exacerbated by demographic factors: with the German population shrinking and aging, the real demand for new housing decreased over time (Ottmad and Hefele, 2006). Unsurprisingly, the industry structure also underwent notable changes. In particular, there was major consolidation among major construction companies. In 1996, there were still 575 of the roughly 80,000 construction companies with more than 200 employees. By 2008, the total number of construction contractors decreased to 74,000, and only 190 companies with more than 200 employees were left (DESTATIS, 2001, 2009).

All three case companies, although different in many aspects of their organizational goals and structures, show striking similarities in their assessments of the market environment, its strategic implications, and the effect that their strategies have on their project management organization (structure) and project management processes. The case companies’ senior management unequivocally sees the German market as secondary in their growth plans. Even when the effects of the current financial crisis and the most pressing liquidity problems subside, Germany remains a country with an infrastructure that is already highly developed, with sufficient or even abundant commercial and housing space, combined with adverse demographics: all factors have led to stagnation in or a decreasing demand for construction. One noteworthy exception is the further development of the transportation infrastructure (mainly roads and railways, but also airports) that, owing to Germany’s central geographical position in the EU and the country’s increasing trade with Eastern Europe, will likely continue for the foreseeable future. Owing to its focus on transportation infrastructure, Gamma’s assessment of the German market was less negative than those of Alpha and Beta. Nevertheless, all firms agree that the most dynamic construction markets are abroad, mainly in developing countries in Asia and Africa. Due to lower vertical integration in international markets, German companies are more reliant on subcontractors, which are considered a major source of risk. Furthermore, the procurement of raw materials with adequate quality is often difficult, and the recent volatility of commodity prices (e.g., steel) makes supply management and price estimation challenging.

5.2. Strategic response

The lackluster growth or stagnation of construction demand in Germany and other developed countries increasingly shifts the case companies’ strategic attention towards real estate-related service businesses that promise a steadier cash flow and lower risk exposure, and enable the offering of package deals...
that include the design, construction, and subsequent management of real estate properties (cf. Bon, 1992). To counter the price pressure in their home market and establish a strong international profile, the case companies have accentuated the importance of developing unique differentiation through innovation and diversification. To this end, especially Alpha and Beta sought to develop new technologies and know-how in technically demanding areas of construction. In terms of Porter’s (1980) generic strategies, they try to move from a low-cost strategy to a combination of segmentation and diversification strategies. It has been shown that, for this purpose, increased innovation is a common response to competitive pressure (Boone, 2000; Vives, 2008).

There are several aspects to this strategy. One aspect is specialization in niche markets, such as particular building and infrastructure types, to convince clients on the basis of strong track records rather than low prices. Unlike before, top management now relies on extensive market analyses before entering a market to ensure a good fit with the organization’s capabilities, and sufficient margins, to make a market entry profitable. Furthermore, all three companies’ senior management perceives strong engineering and project management capabilities as key to their differentiation. We may conclude that, for the first time, the construction companies worked on a sophisticated strategy for regaining competitiveness on a corporate level, covering all business units and group companies. This was new, compared to previous approaches where local autonomy was not questioned as long as (some) profits were earned. The interviewees at Alpha and Beta reported that the strategic change started in earnest in the early 2000s. This is also supported by the management assessments in the annual reports. The interviewees at Gamma pointed to a series of takeovers from 2002 to 2008, which underlined the importance of the real estate-related services besides the traditional construction business. Thus, we conclude:

**Proposition 1.** Severe strategic threats induce a centralization of strategy development and subsequent strategic adjustment.

### 5.3. Adjustment of project portfolio management

As an immediate result, the abovementioned strategy results in a pick-and-choose approach to project selection, limiting the projects to bid on to those that are (a) in a market worth entering from a strategic perspective, (b) a good fit for the company’s (material and immaterial) resources, and (c) sufficiently profitable, also when taking all known risks in account. This contrasts starkly to the previous approach of taking on projects simply to have all available resources operating at full capacity, with comparatively little regard for their strategic fit and risk-adjusted financial prospects. Table 3 provides an overview of strategic goals and their importance to the case companies. As we can see, while all companies moved in the same direction, Alpha and Beta were more committed to the goals listed in the table. Gamma is still more oriented towards price competition, seeking to achieve a cost advantage by higher vertical integration.

For instance, projects at Alpha are classified in four risk categories, from low risk projects (Category 1), to projects with extremely high technical demands, a very short timeframe, and/or other risk factors (Category 4). With the public sector as an important customer, these risk factors are not limited to immediate financial risks, but also include repercussions of negative publicity from accidents, environmental damage, or collaboration with controversial partners. The top management of Alpha, Beta, and Gamma are clear about the importance of public perceptions of their business. An Alpha annual report states: “Increasingly, we see image competition replacing price competition.” Likewise, all other strategic goals are represented by sets of selection criteria leading to more complex selection schema for more differentiated strategic goals. Thus, we conclude:

**Proposition 2a.** The project selection criteria and measures derive from an organization’s strategic goals.

**Proposition 2b.** The complexity of the project selection criteria and measures is contingent on an organization’s strategic goals.

In our case companies, the foremost activity in institutionalizing project portfolio management was a push for organizational centralization. Internal departments responsible for project management functions were set up to perform their tasks as service providers for internal and external customers. Besides PPM, they are responsible for the introduction of new PM methods into the organization, providing PM training and advice, and assisting in project planning and controlling — at project managers’ request. To ease project portfolio management, all companies use a central information system for their project management (PMIS), which they use to perform multi-project management and project portfolio reporting. To this end, Beta introduced a new PMIS with portfolio management capabilities in 2001, Alpha followed suit in 2002 and Gamma in 2005.

In the wake of the case companies’ organizational centralization, the project selection process underwent profound changes during the Baukrise. Alpha, for instance, had its first major reorganization, which heralded the aforementioned changes, in 1999 and 2000. Further changes included a centralized project portfolio, and risk management followed in 2002 and 2003. At the time of the interviews, the already centralized staffing process was improved to better align project teams with strategic goals by carrying over personnel from the estimate and risk assessment phase. A recent Alpha annual report states: “In future, we are committed to only taking on projects of great strategic impact,

### Table 3: Strategic goals.

<table>
<thead>
<tr>
<th>Strategic goal</th>
<th>Alpha</th>
<th>Beta</th>
<th>Gamma</th>
</tr>
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<tbody>
<tr>
<td>Diversification</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Innovation</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Internationalization</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Low prices</td>
<td>Moderate</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Risk mitigation</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Strategic relations</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Vertical integration</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
projects with high profitability and manageable risks.” Alpha (in 2003) and Beta (in 2004) therefore each introduced a strict centralized gating process to evaluate every project by means of financial and strategic criteria. The informants at Alpha and Beta emphasize the importance of the centralization efforts in the gating process. Prior to rigorous gating, the case companies were prone to take on projects of questionable profitability and with extremely high risks. One Beta manager described the situation as follows: “[The new selection process] is a necessary result of many fundamental problems, not only in our company but in the whole industry. What our industry went through over the past 10 years led to the process as it is today, which is simply necessary to protect the company. A lot of nonsense happened before that, which cost the company a lot of money. This had to stop.” Triggered by the environmental factors and the companies’ assessments of the market environment, they made similar organizational choices in their centralization of project management. In an attempt to ensure an alignment of organizational strategies and the project portfolio, all three companies chose the hierarchical level of strategic decision-making as a locus for PPM. This allowed for an easy flow of information, the required level of management attention and seamless strategy implementation throughout projects.

**Proposition 3.** If project portfolio management is introduced, it is organizationally centralized at the same hierarchical level as the locus of strategic decision-making.

5.4. Structural response

As decisions about projects are regularly made by the board or a committee with strong board participation, concise documentation is needed to facilitate swift decision-making. To inform their selection decisions, top management uses a variety of data that evaluates every possible and running project from several relevant perspectives. First, the project needs to fall within the scope of the company’s strategy and expertise. For instance, because Gamma has decided to focus on building traffic routes, it mostly discards bid options outside this scope. At this point, management also considers its strategic goals, specifically bidding on certain projects (e.g., the building of airports) to build a reputation in this field or to leverage internal innovations as competitive advantage in the bid process. Following their diversification and internationalization strategies, Alpha and Beta also try to select a project portfolio that is spread out geographically and in terms of project type.

It is now necessary to create a preliminary project plan for every potential project. Similar to an actual project plan, schedule and resource consumption planning is customary. Such a plan forms the basis for cost estimates and for ensuring the availability of necessary resources. The centralization of project management units that support the creation of these preliminary plans is a matter of efficiency as well as of concentrating planning expertise. By collecting detailed time and material records for tasks and comparing planned values to actual values, the project management units gain insights for future project and resource planning. A PMO member at Alpha notes: “If necessary, I go to the construction site with a stopwatch to measure the durations of certain tasks. [...] This is also crucial in our project controlling, to fend off construction managers that often like to take their time.” These records are relevant for the compilation of bidding documents and price calculations. Having comprehensive knowledge of the time and capital demands, especially in the more exotic or specialized operations, is seen as a strong competitive advantage and significantly reduces risk.

At both Alpha and Beta, the resource management department coordinates closely with the PMO in developing project schedules and thereby reduces the risk of conflicts with other bids or contracts. To reliably plan and allocate resources, all companies introduced a central resource management system alongside the PMIS. The rationale provided by our informants is the efficient arbitration and allocation of existing resources as well as the adaptation of resources to future demands. Resource adaptation becomes more important because project selection is now less dependent on resource exhaustion and more dependent on strategic project fit, leading to a need to size the available resources accordingly.

In sum, we observed that the case companies’ sophisticated portfolio management that considers a multitude of perspectives (risk, strategic fit, resource fit, schedules, etc.) induces a significant need for specific information. Thus, we conclude:

**Proposition 4a.** Every project selection criterion creates the requirement to gather specific internal or external information about every prospective and running project and its context.

**Proposition 4b.** An increase of project selection criteria complexity leads to an increase in information requirements.

To meet the advanced information requirements, financial management and risk management are centralized and elevated to a strategic level. Because high-risk projects – sometimes taken only for reasons of prestige and publicity – used to endanger profits or even a company’s existence, the vetting of projects for risk factors was intensified. Risk management now advises on the project risks, makes bid recommendations, and proposes risk premiums — if necessary. A central risk management department makes it possible to manage individual project risks and to consider the project portfolio risk profile as a whole. All three companies have therefore installed a central risk management unit to estimate project risks and monitor running projects.

As an extension of intensified financial and risk management efforts, there is an increased focus on the management of contracts and resulting claims, the rationale being that many risks can be passed on to subcontractors and suppliers. With decreasing vertical integration, claims play an important role in construction, often providing a major source of income for general contractors and reducing the financial exposure to claims from customers. Informants also point to the considerable legal expertise necessary to assess and assert claims, especially in an international context. The information provided by the legal units responsible for claims and contracts support the decision committee in vetting bids and contracts for viability. As a
Beta executive notes: “We used to have contracts that were signed by some business unit, even if they should never have been, because there were deal-breakers in the fine print and [contract management] was not as involved in the process then, as it is now.” One senior manager comments as follows on claims: “Whether a project is profitable […] is often […] determined by claims being managed properly.”*

A central human resource management organization is responsible for applying the resource adaptation strategy to personnel. Alpha and Beta informants point to the role of human resource development in their innovation process in increased differentiation over competitors. This includes a central knowledge-management strategy to leverage experience in exceptional projects that could be used to compete for similar projects. Professionals with specialized skills can be requested and assigned internationally, and skills deficits can be addressed by means of training. As a PM consultant at Beta notes: “We coordinate personnel adaptation measures in all branches. Nowadays, we fit the resources to the project portfolio, and not the other way around.” To complement their resource management, Alpha and Beta centralized their procurement. Besides efficiency gains, this step is a prompt response to the demands of the resource planning process. Furthermore, in their internationalized structure, these companies want to take advantage of arbitrage effects and procure materials or machinery in the cheapest market.

Overall, several functions in the company were centralized in order to enable the effective synthesis of information for the selection process. Table 4 indicates the main structural changes, as evidenced by the annual reports as well as our informants. One can see a strong coherence in these organizational measures between all the case companies. We argue that organizational centralization was induced by the information requirements created by the introduction of central project portfolio management. The coordinative effort – to for instance, obtain up-to-date, standardized risk profiles or resource consumption reports from dispersed organizational units – is too great and, thus, companies consolidate processes and thereby centralize information. We conclude:

Proposition 5a. To implement project portfolio management, the organization’s structure must be aligned with the information requirements created by the project selection criteria.

Proposition 5b. The organizational alignment involves establishing processes, systems, and organizational units to create, process, and deliver information required by project selection criteria.

5.5. Project portfolio management success

Successful structural change has a significant impact on PPM efficiency and effectiveness. From adapting and extending their organizational structure to the needs of PPM, the case companies experienced several positive effects: First, a proper centralization of important information processes leads to more comprehensive information of higher quality and timeliness, as highlighted by a PMO member at Alpha: “[…] We have experience from former projects concerning cost estimation, risk evaluation, duration estimation, and so on. Project planning becomes easy when you have such information.”

Second, the case companies were thus able to improve their decision-making quality: Informants reported on a significantly improved informational foundation for decision-making, as claimed by a Beta manager: “[…] We have a central planning process for key resources. These resources comprise not only construction equipment but also project managers and engineers. When a key resource is not available, it does not make sense to make an offer for a project that needs this resource.” Furthermore, risks and consequences of decisions became apparent; decision-makers were more confident that their decisions actually complied with strategic objectives, as pointed out by a project manager at Gamma: “[…] if the client decides to change the risk accountabilities or the payment arrangements during the bidding phase, and if these changes are not compliant with our strategy, we cancel our project offer.”

Third, the institutionalization of information-gathering for PPM legitimized it and gradually established a consensus that PPM is the right method to use. While in the early phases of PPM adoption, there were insecurities and reservations

Table 4: Structural changes and respective information contributions.

<table>
<thead>
<tr>
<th>Structural change</th>
<th>Information contribution</th>
<th>Evidence in case companies*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralization of project management office</td>
<td>Schedules, resource plan, and cost estimates; project progress; planning compliance</td>
<td>Alpha: I, Beta: I, Gamma: I</td>
</tr>
<tr>
<td>Centralization resource management</td>
<td>Resource availability, resource adaptation potential</td>
<td>Alpha: I, Beta: IA, Gamma: I</td>
</tr>
<tr>
<td>Centralization of procurement and supply chain management</td>
<td>Resource availability, resource adaptation potential, procurement risks</td>
<td>Alpha: I, Beta: A, Gamma: IA</td>
</tr>
<tr>
<td>Centralization of human resource management (recruiting, reductions, project staffing)</td>
<td>Resource availability, resource adaptation potential</td>
<td>Alpha: Al, Beta: Al, Gamma: A</td>
</tr>
<tr>
<td>Centralization of customer and supplier relationship management</td>
<td>Resource availability, procurement risks</td>
<td>Alpha: Al, Beta: A</td>
</tr>
<tr>
<td>Centralization of risk management</td>
<td>Risk mitigation</td>
<td>Alpha: A, Beta: Al, Gamma: Al</td>
</tr>
<tr>
<td>Centralization of claims management</td>
<td>Risk mitigation, strategic relationships</td>
<td>Alpha: Al, Beta: Al, Gamma: I</td>
</tr>
</tbody>
</table>

* A: annual reports, I: informants.

* All quotes are translated from German.
Regarding its introduction, the newly established organizational units and processes with their proponents countered this doubt, and working PPM practices swiftly convinced laggards of the value of PPM.

Four, informants overall described the structural alignment as an important antecedent of effective strategy implementation, which avoids misled investments and overly risky initiatives, while at the same time assures that strategic objectives are met, as pointed out by a PMO member at Alpha: “[…] the chief risk officer, who is a member of a board of directors, decides to which risk class a project belongs. Project risk monitoring becomes essential owing to the problems our industry faces and the many companies that have lost a lot of money as a result of senseless decisions.”

**Proposition 6a. Adequate structural alignment with the needs of PPM leads to greater PPM success.**

**Proposition 6b. A structural alignment is adequate when it warrants the timely and efficient delivery of high-quality information required by PPM.**

From a holistic perspective, our case companies’ strategies within the examined timeframe were successful. Considering the many other large construction companies that succumbed to the competitive pressure during the Baukrise, mere survival during these years can already be deemed a success for them. Due to the long-running nature of projects that our companies typically take on, a certain lag before the positive results are measurable in the balance sheets is to be expected. However, comparing the revenues and profits of our case companies (averaging the periods from 2001 to 2003 and from 2006 to 2009), we can see moderate to high revenue growth and, at the same time, a disproportionate increase in profits. Alpha increased its revenue by 55%, while increasing profits by 514%. Beta’s revenue rose by 150%, and its profits by 225%. Gamma grew its revenue by 17% and, at the same time, increased its profits twentyfold. The success of our case companies exceeds the growth of the construction sector as whole (DESTATIS, 2010) by a large margin.

From the evidence, we can now derive a generalized theory of the structural effect of project portfolio management. The propositions stated above express the primary causalities that we elicited from the case material. In times of strategic threats, organizations tend to centralize their strategy development and implementation. Given a strategic management process, an organization develops and explicates an organizational strategy with specific goals. These goals are then used to define the selection criteria for projects and goals for the overall project portfolio. Each project is assigned a number of attributes matching these criteria; the same is true for the overall portfolio of running and scheduled projects. These attributes of both the projects and the portfolio are solicited by organizational information providers. The individual project attributes on which a selection decision is based, in combination with the current portfolio attributes, are then evaluated using the strategy-derived decision criteria. The structural changes are triggered by the demand for information providers capable of assigning the required attributes to projects as well as the project portfolio. Ultimately, an adequate structural alignment will foster successful PPM in terms of acceptance, decision-making quality and strategy implementation.

**6. Theoretical integration**

We now proceed to interpreting our substantive theory of the structural effects of strategy implementation via PPM through the lens of major theories in organization science. All our case companies underwent a clear organizational transformation towards centralization of strategy development and project portfolio management. Prior scholarly work on organizational archetypes can explain this process. Before the transformation process, our case companies could be characterized as adhococracies with strategies that are more the result of individual behavior than of a careful planning process (Mintzberg and McHugh, 1985). The later organizational structure reflects a move from adhocracy to a form that can best be described as a machine bureaucracy (Mintzberg, 1980). However, while some of the characteristics of machine bureaucracies match (such as formalization of behavior), others do not (e.g., low level of training). This can be explained by Mintzberg’s focus on operational work processes, which strategy development and portfolio management are not. A similar yet more elaborated model by Staw et al. (1981) describes how organizations react to environmental changes that lead to threats. They analyze such threats’ effects at individual, workgroup, and organizational levels and conclude that organizations react through a multitude of responses, including centralization of authority, increased formalization, and reduced communication complexity; these were present in our case companies.

In more general terms, the contingency theory of organizations has been widely acknowledged for its ability to explain the structure and performance of organizations (Donaldson, 2001). In its essence, contingency theory holds that an organization’s performance is contingent on the fit between the organization and environmental as well as internal factors, which are surmised under the term contingencies (Child, 1973; Lawrence and Lorsch, 1967). Since organizations generally seek to perform, they thus also strive to attain a fit with their context, and therefore seek to readapt if their context changes (Donaldson, 1987). As noted, the environment imposes one or many contingencies that influence business strategy (Hofer, 1975) and, to some degree, limit the choices that managers can make during strategy formulation so as to attain viable results (Hrebiniak and Joyce, 1985). When formulated, the strategy itself becomes a contingency that partly determines an organizational structure’s success (Donaldson, 1987), besides other factors such as organizational size (Child, 1973). Apart from its impact being mediated through strategy, the environment may also directly influence organizational configurations (Venkatraman, 1989). Contingency theory has strong explanatory power for the phenomena that we observed in the case companies. Not only does it clarify the effect of environmental changes on business strategy, but it also explains the general organizational transformation mechanisms due to the implementation of such strategy. As we have seen, the main driver of structural change is the necessity to establish information flows between different parts of the organization.
Galbraith (1973, 1974, 1977) sees the properties of organizational information processing (OIP) as highly influential in the shaping of organizational structures. Galbraith’s main tenet is that the demand for information and the capacity to process it increases with the uncertainty of a task’s environment. This is undoubtedly the case for the case companies, who must cope with a significant increase of uncertainty in their strategic environments. Along similar lines, project portfolio management, particularly the selection of the right projects in terms of strategy, financials, and risk, is a complex task involving a high level of uncertainty (Langford and Male, 2001).

Galbraith (1977) also proposes that, when faced with high uncertainty levels, organizations should rely on setting goals, rather than meticulously defining processes and routines. He holds that it is impossible to define processes while anticipating all eventualities of a volatile situation. One should rather set goals and efficiently gather the information required to make sound decisions. We have clearly seen such behavior in the construction industry. Selection committees do not follow a mechanistic set of rules. Instead, while the criteria are usually well defined, the committee has considerable freedom to weight and interpret the information provided for their selection decisions. This is necessary to reach strategic goals in the light of constantly changing environmental factors and portfolio attributes. In light of Galbraith’s theory, selection committees can be seen as lateral relationships allowing for efficient decision-making in a group of all relevant stakeholders (Galbraith, 1974).

The project portfolio management information requirements are determined by the project selection criteria, while the information processing capacity is determined by the individual and collective capacities of selection committee members. Since the selection criteria have been extended dramatically, so too has the information required to base selection decisions on. However, the information processing capacities of executive boards and selection committees are limited (O’Reilly, 1980). Galbraith proposes the creation of vertical information systems – that is, organizational units that collect information from all organizational levels as one way to address information requirements (Galbraith, 1974). These units are responsible for interpreting and condensing the vast information gathered at all hierarchical levels and enabling the various decision-makers to process it. More generally, information processing theorists argue that good organizational structure is achieved when a task’s information requirements are matched with the information processing capacity of those charged with completing this task. The greater the uncertainty and therefore the information requirements, the more effort an organization must exert to collect and prepare information (Egelhoff, 1982). As noted, modern construction companies go to great lengths to gather and pre-process information for the consumption of those responsible for project selection. They do so by creating vertical information systems (to use Galbraith’s term) in the form of centralized departments, for instance, for risk information (risk management), resource information (resource management, HR management), and scheduling (PMO).

What we could not observe in our cases were forms of self-contained tasks and slack resources (Galbraith, 1974). We saw that the latter were simply not an option for the case companies in times of fierce competition, often based on prices. Self-contained tasks could indeed be observed, but only at the project level, whereas at the strategic or portfolio level, other design strategies dominated. Based on our case analysis, we can conclude that the frequency of strategy development and portfolio management processes did not justify the definition of self-contained tasks with organizational restructuring.

Fig. 1 shows the complete path from the strategy changes to the structural changes induced by the implementation of a new strategy. We also annotated the causal flows with our propositions, which closely match the predictions derived from organizational theories.

7. Conclusion

In this paper, we presented the results of an investigation into the structural changes induced by strategy implementation using project portfolio management. We believe that the described findings generally apply to project-based business models. However, since our study is limited to construction contractors, there is still a need for research in other industries (besides construction) to establish the findings’ validity. For this purpose, it would be fruitful to conduct a quantitative study that relates the choice of strategic configurations with information requirements, and tests the co-occurrence of these requirements with corresponding organizational structures. Because several quantitative studies have successfully operationalized information requirements, we are confident that such a study would not only validate our theory, but would also yield further insights into the dynamics of OIP in a project management context (Egelhoff, 1982; Leifer and Mills, 1996).

Our study’s theoretical contribution is twofold. First, it lies in the integration of strategy implementation, organizational information processing, and structural adaption. While information processing has been used as paradigm to study the fit between strategy content and organization (Egelhoff, 1982; Rogers et al., 1999), as well as to shed light on organizational fit with environmental contingencies (Daft and Lengel, 1986; Kleinschmidt et al., 2010), our study is to our best knowledge the first to explain the link between strategy implementation and organizational structure using an OIP perspective. Since the ability to adequately procure and process information is not only important for strategy formulation and strategy implementation (Hrebinjak, 2006), it stands to reason that organizations aligned with the information requirements of strategy implementation are more efficient and/or more agile in implementing new strategies. Second, our study establishes a new perspective on PPM, broadening the narrow focus of methodological approaches. We have shown that a major antecedent of successful PPM is structural alignment. PPM’s implementation in project-based organizations is thus not merely a matter of defining project selection techniques, but – rather – it shapes the organizational structure as a whole. This paper’s primary contribution is therefore a new perspective on the requirements of PPM implementations and strategy implementation with PPM. Many organizations still struggle to set up an effective and efficient
multi-project environment (Elonen and Artto, 2003; Engwall and Jerbrant, 2003). Using an information requirement approach enables practitioners to analyze the organizational impact of comprehensively introducing PPM. While some literature on PPM acknowledges the importance of accompanying organizational measures, such as the centralization of resource management or a central PMO, it provides no guidance on their relative importance and how much effort should be invested in these measures in the particular context of any organization. Using strategic information requirements as the point of departure for PPM design, organizations ought to be able to establish a close link between the strategy and project portfolio management processes, and ought to be able to successfully implement strategies.

References


