

The productivity dilemma in project-based firms: Why do organizations tie their own hands?

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Abstract (600 characters)

In repetitive operations the productivity dilemma has been widely studied, but there is a lack of research in non-repetitive operations, such as in project-based firms. This paper investigates why project-based firms foster or hinder project flexibility through an embedded multi-case study with six projects within a large German project-based firm. The results suggest that although such firms have projects as their key source of revenue, their focus lies in longevity and survival and this logic is, in some instances, at odds with the temporary nature of the project context.

Keywords: Ambidexterity, project-based firm, temporary organizations

Introduction

While encouraging creativity, the management of projects has been developed and refined to promote efficiency and reliability, so that unique endeavours are planned, controlled and delivered on time, to cost and quality requirements. The promise of ‘controllability and adventure’ (Sahlin-Andersson and Söderholms, 2002) attracted practitioners, and project management became a common practice across industries, such as construction and engineering, both as the primary source of revenue and to manage new product development, development of information systems and organizational change, among others.

However, empirical studies suggest that instead of promoting flexibility and control, projects become bureaucratized. Over 70% of project managers complain about the bureaucracy of project processes (Crawford, et al., 2005) and the investments to increase efficiency neither provide management with accurate and credible information nor facilitate putting projects ‘back on track’ (Williams, 2005). Therefore, why do practitioners continue to reduce the flexibility of projects and increase control?

One of the reasons for the bureaucratization of projects is the tensions between projects and parent organization. Hodgson (2004) identified that while senior levels perceive projects to have high levels of flexibility, middle management complained of bureaucracy

involved in managing projects. Styhre (2006) portrayed the case of a project that was driven by administrative procedures rather than in doing the work and solving emergent problems. In preliminary interviews, project managers said that “sometimes our organization gets in the way”, 60% of their time is spent in attracting and securing internal resources for the projects, and the other 40% in reporting. The results are intriguing as the organizations studied were project-based firms, i.e. firms for which projects are the primary source of revenue, so it is expected that they would be better at reconciling the flexibility necessary in projects with the pressures to increase efficiency and reliability to increase competitiveness and profitability.

The problem faced by project-based firms reflects the ‘productivity dilemma’ caused by the tension between efficiency and flexibility. The dominating view was that efficiency necessarily requires bureaucracy, and bureaucracy hinders flexibility, so there is an intrinsic trade-off between efficiency and flexibility.

If we accept the productivity dilemma as ubiquitous we need to accept that the promise of ‘controllability and adventure’ is unrealistic, and so the empirical studies reported above indicate that the management of projects focuses on efficiency at the expense of flexibility. However, recent empirical studies portrayed examples of organizations, such as Toyota, that have transcended the paradox and reconciled efficiency and flexibility (Adler, et al., 1999; Tushman and O’Reilly, 1996). The consequence for management is that flexibility and efficiency are not two extremes, but are orthogonal. The ability to be both efficient and flexible was called “ambidexterity” and found to be positively correlated with organizational success (He and Wong, 2004).

Given the clear tension between flexibility and efficiency in project-based organizations, we may expect that ambidextrous management would be valuable to improve performance of projects and project-based firms, but still the evidence suggests there is pressure to increase efficiency at the expense of flexibility. We attempt to understand the barriers these firms face to develop ambidextrous management in project-based firms and ask ‘why do they reduce the flexibility of their projects?’ We address these questions through an embedded multi-case study in a large firm specialized in engineering and production of large and highly capital intensive industrial plants. We explored the tensions between the specific needs of six projects and the structure and processes of the project-based firm.

Productivity dilemma and the project-based firm

The term ‘project-based firms’ was created to delineate a network of firms created to execute one specific project, such as in the film industry (DeFillippi and Arthur, 1998). Today the term also refers to firms that have projects as key source of revenue (Söderlund, 2004). Examples of such companies are construction firms, information system developers and advertising companies. Although work is carried out mainly in temporary constellations, there is still need for permanent structures and processes (Sydow, et al., 2004). There is a clear influence of the project-based firm on the way projects are shaped (Engwall, 2003), but studies pay little attention to how these firms support projects. Exceptions are the work led by the Scandinavian School of project management (e.g. Sahlin-Andersson and Söderholms, 2002) and the work on CoPS (Complex Products and Services).

The productivity dilemma is a common challenge in project-based firms. However, there are few publications that touch this issue implicitly or explicitly. In general, although

the concept of ambidexterity is not new, it has gained momentum only recently and count with a growing number of contributions across different knowledge areas (Raisch, et al., 2009). Common across these areas is that, to be competitive, organizations need to be efficient, create routines to avoid repeated mistakes and dead-ends, but also have flexibility to adapt to major shifts in context and ensure long-term competitiveness. The paradox is that *“Efficiency requires a bureaucratic form of organization with high levels of standardization, formalization, specialization, hierarchy, and staffs; but these features of bureaucracy impede the fluid process of mutual adjustment required for flexibility; and organizations therefore confront a tradeoff between efficiency and flexibility”* (Adler et al, 1999: 44). Organizations pursuing exploitation and exploration simultaneously have higher long-term performance. This theory is supported by an array of empirical evidence, e.g. Gibson and Birkinshaw (2004) and Raisch et al (2009).

Sceptics argue that firms can only reconcile these modes of working when they are catching up with competitors, but not when they are creating something genuinely new. Defenders respond with cases such as Toyota’s Prius, and show that it is possible to innovate and be lean (even after the technical problems at the beginning of 2010).

In project-based firms, the concept of ambidexterity has been indirectly explored by Brown and Eisenhardt (1997) who studied the commonalities among successful project portfolios and propose, among others, semi-structures for balancing efficiency and flexibility by establishing clear priorities and responsibilities, intensive communication, and room to improvise in the course of the project. Brady and Davies (2004) discuss ambidexterity in project-based firms and propose the economy of repetition, whereby the firm learns from projects and therefore project-based firms can start new projects based on the knowledge accumulated from previous ones, creating an economy of repetition that cannot be achieved by companies with less project experience.

The results indicate that ambidexterity in projects is different than in repetitive operations. It is widely agreed that ‘exploitation’ is the core business and essential for short-term profits, and exploration is necessary to ensure flexibility and long-term survival. Project-based firms use exploration as the way of working and attempt to increase levels of exploitation by, for example, introducing PMOs. These companies are also very close to the client, its challenges and changes, so technological shifts are easier to predict. There is a dearth of publications in ambidexterity applied to non-repetitive operations in project-based firms. This work applies the current discussions on the productivity dilemma and ambidexterity to project-based firms and attempts to understand the barriers to establishing ambidextrous management. Specifically, we address the question “Why do project-based firms reduce the flexibility of their projects?”

Methodology

Overview of the Company

The company analyzed is a large plant engineering company with over 24,000 employees in more than 200 facilities worldwide and a turnover of over €3bn in 2004 (date of the data collection). The company supplies integrated and customized plant solutions for a continuous production process. The project budget varies from €3mn for spare parts or small rebuilds up to €300mn for a new production line. A complete plant project takes about 18 months from contract signature to ramp up. Such plants are highly customized and many involve development of new technology. The company was founded almost 200

years ago and remained family-owned for most of its existence. It grew mainly organically, but also acquired several smaller firms with complementary portfolios. The company incorporates in itself the technological know-how necessary to design the entire production process, starting in the processing of the raw material to the production of the final product. The market is relatively small and very transparent. The potential clients are concentrated in the hands of a few players, and so is the competition. Fluctuation of order intake is a significant threat to the industry; losing any large order leads to grave impacts on turnover, as well as to a lost opportunity for technological development in some cases.

Data collection

An embedded multi-case study was carried out with research design providing an in-depth understanding of the organization as a whole, including structures, processes, culture, preoccupations, etc. Examples of the productivity dilemma were deliberately sought in a sample of six projects and through general observations. The tensions of each individual project were followed up through further interviews, documentation and observations. The project cases followed the principles of several independent experiments of multi-case studies, but within one organizational setting – what Yin (2003) termed an embedded multi case-study. The sample was defined together with members of the organization, and was deliberately composed of different types of projects realized in the organization, i.e. having differing sizes, technological difficulty, type, client, etc (see Table 1). This was relevant to explore how different projects were challenged by common structures and processes.

Table 1 - Overview of Cases

Project cases	Phase during observation	Type	Size	Perceived difficulty	Perceived success
Case 1	Completed	Refurbishment	Medium	Medium	Low
Case 2	Completed	Refurbishment	Small	High	Low/Medium
Case 3	Manufacturing	Refurbishment	Small	High	Medium/High
Case 4	Engineering	New machine	Large	Low	Medium
Case 5	Completed	New machine	Large	Low	High
Case 6	Completed	Refurbishment	Large	High	Low

The first author spent three months in the firm as an observer with a clear role as researcher. She was physically present in different organizational units, in both sales and execution phases. Data were derived from observations of work place, meetings (formal and informal), informal conversations and formal interviews. At least three interviews with members of same project team were carried out and supplemented by document analysis (including scheduling, reporting, budget, cost plans and actual and post-project reviews). A record of observations was kept by the researcher as well as a protocol of the facts, ideas and stories (by writing or recording of researcher’s own notes). Only some of the interviews were fully transcribed, but the majority were recorded. Notes kept during and straight after the interviews assisted the data analysis. Data collected about the projects was mainly in German. There were also telephone interviews, visits and face-to-face interviews in Portuguese with two people from the facility of the company located in Brazil since projects 1 and 6 were partly manufactured there.

Description of projects

Case 1 was a medium refurbishment project in Australia. What was exceptional about this was the very limited time to complete the work on site, which demanded a high level of pre-assembly. However, in an attempt to improve efficiency and profit from favourable exchange rates, the work was shared between five facilities in three different continents. This led to logistic issues, as large preassembled parts had to be shipped around the globe.

Case 2 was embedded in a complex political context. The facility in the US won the order while it was closing and transferring its activities to the headquarters. The US facility did not have enough know-how to design a sophisticated machine and was about to sign a contract with very low technological maturity. The headquarters intervened in the last weeks of negotiation.

Case 3 was an internal project to construct the facility for the newly founded business dedicated to R&D. It included a piloting machine and office buildings located near to the headquarters. The piloting machine was based on an existing smaller machine, and therefore considered a refurbishment. The project function of the company was being the main contractor, coordinating all partners, including civil works, an exception for the firm.

Case 4 was a large project and an example of the dark side of standardization. The project was to copy an existing machine bought by the client a few years earlier. Suppliers and their products and technologies had changed, and this demanded adaptations in the machine. However, the client was reluctant to pay for engineering work for a copied plant. Internally the project worked very well; it was prestigious and had high priority.

Case 5 was a large and prestigious project. The relationship with the client was mature and good, the project had realistic goals and enough available resources. Surprisingly, although the plant was based on a standard technological concept, with few upgrades, the ratio between engineering hours and project budget was as high as in refurbishment projects.

Case 6 was a plant refurbishment. Almost every section was replaced, making it equivalent to a new plant in scope. The plant was very complex both technologically and commercially. A section of the plant was offshored to Brazil for the first time. Engineering hours were 30% higher than expected due to knowledge transfer and interface coordination among the facilities.

Data analysis

The aim was to explore the tensions between flexibility and efficiency, their impact in projects and the underlining reasons for project-based firms' inclinations towards efficiency. Firstly, evidence of tensions were identified and summarized in Table 2. In the second step, we stepped back from the specific cases and attempted to understand the company as a whole and the underlining reasons for the tensions and the inclinations the company has taken.

To improve validity of the results, care was taken to confirm that the tensions were not only an opinion of a single practitioner, but rather agreed across at least two or three people involved with the tension. The cases acted as examples and specific information about the tensions and practices. Thus, the work does not aim at generalisation, but illustration of a organisational phenomenon.

Table 2 - Description of tensions and respective coping practices

Tension Type	Description	Inclination of the firm	Cases
Risk avoidance vs. explore opportunity	<ul style="list-style-type: none"> • Client did not effectuate the down payment still top management decided to carry on project. • Civil works was not added to portfolio 	Flexibility/ Exploration	2
Standardization of tech solutions vs. customization	<ul style="list-style-type: none"> • Go ahead decision to a project with very low technological maturity • Client required a copy of a machine, but changes were unavoidable as issues uncovered by ramp up of original machine needed to be incorporated and suppliers changed their product configurations • Use of standard concept for a new large machine made it difficult to implement learnings of similar machine newly completed 	Flexibility/ Exploration Efficiency	2 4
Global vs. Local	<ul style="list-style-type: none"> • Attempt to exploit global resources led to complex and expensive logistic problems • Division of market among facilities went against client's wish for German brand and coordination 	Efficiency	1, 6 4
Standard processes vs. situated action	<ul style="list-style-type: none"> • Software for engineering calculation was not suitable to refurbishment projects. 	Efficiency	1, 4 and 5

Reconciling efficiency and flexibility in project-based firm

Previous research suggests that project-based firms attempt to increase efficiency, reducing flexibility and creating bureaucracies that are not appropriate to projects (e.g. Engwall, 2003; Hodgson, 2004). However, it is still unclear why project-based firms attach more weight to efficiency at expense of flexibility. In attempting to understand the underlying reasons for the four tensions identified in the cases we found that project-based firms think beyond their projects and create long term advantages, as any firm in repetitive operations. They protected themselves from the risks involved in projects, searched for commonalities, and implemented management and technical solutions across projects. However, these attempts were constantly challenged by the specifics of each project and the short term horizon involved.

An illustration is the tension between exploring new opportunities and avoiding risks (Case 2 and 3), well marked in the company's systematic avoidance of civil works and project finance. According to a salesman and two project managers, this choice led to the loss of promising orders. One of the cases studied was an exception; Case 3, which included building works. This took place on the company's site to keep complete control over the entire project. Construction partners were those already known from previous projects in Germany. The project manager took the opportunity to conduct a study about the advantages and disadvantages of civil works. The findings suggest that the civil works reduced transaction costs of adjustments and interface coordination, especially in assembly and ramp-up phases, and increased project flexibility. He explained that delays of parts of the machine could be quickly accommodated with minimum extra costs through changes in the sequencing of civil work activities. Technical building services, machine peripheries and automation worked closer together, making the building more efficient, as interface

issues decreased and similar material was used, reducing the variety of spare parts. Further, the development of solid partnerships with excellent building companies reduced the risks involved in construction (Schröder, 2006). Still, leaders of the company perceived such projects as high risk since other competitors had gone bankrupt in such undertakings. Thus, they have kept with their decision. The focus was clearly on self-preservation and this was hard to negotiate. While each project could profit from the coordination of civil works on a short-term basis it could risk the firm survival, and therefore imposing limits to the flexibility of projects was important.

While the tension between exploring opportunities and risk avoidance was clearly related with issues of survival, the other three had an indirect connection and pointed to attempts to improve and learn from experience of projects, creating economies of repetition, as identified by Brady and Davies (2004). This was clear in the tension between developing standard technological solutions versus customizing each order. The company had a very strong engineering focus, so that the organizational structure was built around technologies and a business unit specifically focused on research. The engineering department was willing to engage in customized solutions, especially if these involved new prototypes. This ethos was enforced by the slogan of the company that stressed customization and innovation.

In contradiction the company was also investing heavily in the development of standard technological solutions. So, it could save time and effort in engineering and compete in low cost markets. Moreover, it ensured reliability; mistakes were not repeated, interfaces between machine parts were clearer, machine parts of same supplier were used across the plant, etc. A significant number of engineering hours was dedicated to update standards based on newly concluded machines. The tension is clear in statements such as when the salesman points to the slogan of the company and says *“but actually the focus is on reliability”*, or the project manager states: *“We have a mix of everything. It depends on the client. (...). However in general we set value on reliability”*. The engineers complained that standardization of technological solutions demand time, as each part of the machine need to be proved in detail. They argued that by the time it can be considered a reliable standard, the technology is out of date and other newer machines produced more recently become more interesting as a starting point than the standard.

The cases confirm this tension. In Case 4, the attempt to copy a machine proved difficult due to discontinuities on the supplier market and developments in technology. Learning from the first machine also needed to be introduced in the “copied” machine. This is apart from the new engineering and management team that also influenced the way the project was realized.

Case 5, in contrast, shows that the efforts to develop standards may payoff. This was a large new machine that used the standard concept developed by the firm and which seems to have worked very well. The project was the most successful of the sample and highly regarded by all interviewees. However, the engineers confessed that they spent time reworking the standard and updating it. The total hours of engineering/budget were higher than for the refurbishment projects. This is a lot, as the latter is very demanding in detail engineering in the interface between the old and new parts of the machinery.

While there was value in producing standard products, the attempt to create plants ‘off of shelf’ has proved unrealistic. The wish to create long-term gains has ironically been impossible in the long term. Again, a focus on longevity is at odds with project practice.

In an organizational layer, the division of work between facilities was also a source of tension. The company implemented an organizational solution tailored for repetitive operations. The organizational structure attempted to exploit resources and competences of each subsidiary and make them work together, so that the overall profit of the firm could be maximized. However, the internal organizational structure and governance significantly reduced project flexibility. The company is divided in independent centres of excellence that have to cooperate with each order; thus, a typical project has to coordinate the work of several of these centres, in different countries, languages and time-zones.

Case 1 is a good example of impacts of such an organizational model in project-based firms. The large refurbishment project in Australia had limited time to complete the work on site, and hence required a high level of pre-assembly. However, the internal organizational design led to a logistic ‘chaos’ as high value pre-assembled parts had to be shipped to different countries and high import-export taxes had to be paid (see details in Geraldi and Adlbrecht, 2005). Case 4 was another example. The Chinese client preferred the German facility to manufacture the parts of the machine and coordinate the project; however, the Chinese facility was responsible for the market and had strong reservations about letting the headquarters keep the project they attracted in their own country.

Attempts were made to improve the structure by incorporating exceptions lived in specific projects, which made, for example, the Brazilian facility responsible for the market in a country in Asia¹. But these were invariantly different in each case. Here again there was a tension between an organizational solution based on permanent logic that have shown to work for repetitive operations, but it actually hampers project-based firms to accommodate the temporary needs of each project.

Finally, the productivity dilemma also impacted decisions in operational areas. Generally, the company awarded high flexibility in its processes. The controlling and reporting system was lean, the processes were aided by “home-made” tools, and only a few forms and procedures were mandatory; and, usually, people were open to change.

However, during the period of observation the company introduced the mandatory use of engineering software that impacted the flexibility of several projects. The software was beneficial for the new machines (4 and 5) but disadvantageous to refurbishment projects, especially Case 1. Very good engineers were also distressed with the solution as they had their own excel sheets with the calculations that they have been refining for years. The company though insisted on the use of the software. The aim was not only reduce mistakes and increase reliability of engineering solutions but also to integrate engineering of different types of projects and create a common language across the company. Here, Lawrance and Lorsch’s (1967) differentiation and integration dilemma appears to play an important role. But the data also confirms the attempt to establish permanent solutions in temporary settings.

A new layer of analysis

In conclusion the evidence suggests that, although multi-project firms have projects as their key source of revenue, their focus lies on longevity and survival and this logic is, in some instances, at odds with the temporarily of project context. What makes this finding significant is that it seems at first sight particular to project-based firms. Repetitive

¹ This evidence was not observed in specific cases, but rather extracted from interviews and documentations.

operations will have the strategic layer pushing for changes and new opportunities in the long-term, while the operating environment prefers maintaining the routine. Project-based firms have the exact opposite logic. As shown in Table 2, the firm focused on long term efficiency in the great majority of the cases, and the projects attempted to develop flexibility in the short-term. Such a statement sounds strange at first. Wouldn't project-based firms have core rigidities and need to push for new developments in their strategy, or would they have dynamic capabilities inherent to their operations? Although this could be an interesting argument to explore, perhaps in a future study, Case 2 contradicts this argument. It could be possible that the market changes, the coordination of civil works become more relevant and the company would struggle to survive.

The findings suggest though a different layer of analysis of ambidexterity: the tactical layer. The focus of studies in ambidexterity has been on long term organizational renewal, even for those exploring contextual ambidexterity. However there is also a need for a less long term view focused on organizational survival and creation of efficiencies as form of competitive advantages. This layer still challenges daily operational practice, but this time not by breaking inertia, as the traditional ambidexterity thinking, but by flexing structures to project or exceptional realities. Figure 1 illustrates the different layers of analysis.

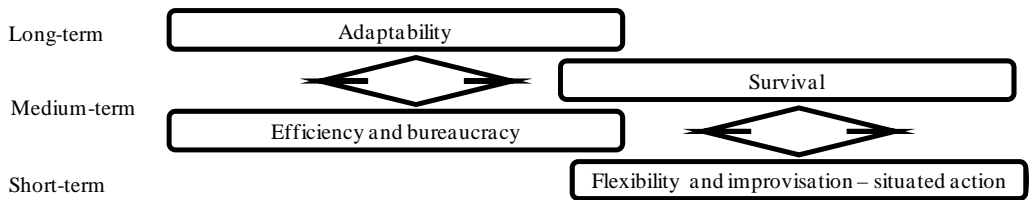


Figure 1 - Layers of productivity dilemma

Conclusion

This research studied the productivity dilemma in project-based firms and provided tangible examples of how these tensions impacted projects. The work suggests that a barrier to establish ambidexterity in project-based firms is the dichotomy between temporality of projects and permanent structures and processes imposed by project-based firm. In contrast to repetitive operations, the long-term strategy of project-based firms focuses on efficiency and not on flexibility.

Project managers need to understand that much of the bureaucratization of projects lies on the attempt to ensure reliability and survival, but if project managers are able to convey the long-term focus of their actions and show that the permanent logic may rather endanger firm's survival, they are in a good position to break unnecessary bureaucratic processes. Top managers also need to accept that their business involves high risks and is inherently temporary, and they need to carefully tailor what projects they can and cannot treat similarly to repetitive operations. Further, the work contributes to the general body of literature on ambidexterity by showing that ambidexterity should also be explored not only in a long term, but also in a tactical levels.

There is room to continue the study. We have seen that project managers' actions are constrained by organizational processes and procedures. However, change is an inherent characteristic of projects (e.g. De Meyer, et al., 2002), and therefore, flexibility is mandatory to manage them. So, if projects need flexibility and project-based firms reduce such flexibility, one could expect that project managers need to bypass bureaucracy to

succeed. Thus, a future avenue to explore is how project managers muddle through the organization's inflexibility to create the flexibility necessary in projects. If our assumptions are correct, the practices can make project-based firms ambidextrous, and transcend the temporary / permanent dialectic.

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