

Innovation in project-based firms: The context dependency of success factors

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Abstract

Innovation management literature typically concerns functionally organized firms. In this paper we investigate innovation management in a different type of firm, the project-based firm. Project-based firms, such as engineering and construction companies, consultancies and system integrators, are service firms that solely execute projects for clients. We focus on new service development projects in these firms. Based on an in-depth study of six projects in four different firms, we develop hypotheses on differences between success factors for development projects in project-based firms and in functionally organized firms. Some of the success factors for functionally organized firms, as described in the literature, appear to be more important in project-based firms, others seem redundant. Our findings suggest that the specific structure and capabilities of project-based firms provide an explanation for these differences.

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1. Introduction

Most literature on innovation management implicitly or explicitly concerns manufacturing and other technology firms (Montoya-Weiss and Calantone, 1994). Many of these firms are functionally organized. The question is whether the findings from this literature are also valid for firms with a different type of organizational structure.

In this paper we study innovation processes in project-based firms. Project-based firms have a project-based organization (Hobday, 2000) and use projects to provide unique services to their clients. These services

can be combinations of custom-designed products and related services. Examples are engineering and construction companies, consultancies and system integrators. Project-based firms contribute considerably to the gross national product of most Western economies (Gann and Salter, 2000; Knight Wendling Consulting, 2000). Innovation in these firms involves developing new or improved services for current or prospective customers, or developing new technologies that can be used to solve clients' problems better than existing technologies.

The organization of project-based firms is clearly distinct from functionally organized firms, such as most manufacturing firms (Hobday, 2000). Starting point of this research is the assumption that organizational context, or more specifically the structure and capabilities required for the execution of projects by order of clients, affects the management of development projects. As a project manager of an innovation project

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in a project-based firm explained to us: “New product development seems to be all about project management and we know how to manage projects”. In our opinion also managers of project-based firms can learn from the innovation management literature, if the findings of this literature are re-investigated for this type of firm.

1.1. *Project-based firms*

Project-based firms are firms that are set up around projects (Gann and Salter, 2000), and that produce complex services for their clients (De Brentani and Ragot, 1996; Prencipe et al., 2003). The services usually consist of the integration of products or systems, such as IT systems, delivered in a business-to-business environment. Hobday (2000) distinguished between project-based and project-led organizations. A project-based organization is an organization in which the functional organization has become completely obsolete, without formal functional coordination of activities. Such an organization is entirely dedicated to one or more projects. In a project-led organization the needs of projects outweigh the functional influence on decision-making. A project-led firm still has some characteristics of a functional firm, since there is some coordination of functionally equivalent activities. Our definition of project-based firms encompasses both the project-led and the project-based organization. Although accountancy firms and lawyer’s offices also carry out projects, we exclude these firms in this paper, since their projects often concern specialized services of limited size and not the integration of products and systems.

Business projects are those projects of project-based firms that are executed by order of a specific external client. These project offer unique solutions to each client (Hobday, 2000). Clients typically initiate a business project, define the specifications, provide financial resources, and at the end benefit from the deliverables (Turner, 1999). Business projects are managed autonomously (Hobday, 2000), primarily bounded by the contractual agreement with a client (Turner, 1999). Frequently, a multi-disciplinary team is used to execute a business project and more disciplines will be involved if a project is more complex. Expertise and reputation of personnel is important for the success of business projects, although many project-based firms counterbalance fluctuations in demand with temporary personnel. Business projects differ across firms with respect to duration, content, and project size. For instance, the content of a construction project bears little resemblance with that of an IT project. Despite such differences, the phases of such projects show many similarities, from concept

definition, design, construction, implementation, to testing and operation, although not necessarily every project includes all phases.

On top of business projects, project-based firms also perform *development projects*. Development projects are projects aimed at innovation, and take place separately from business projects. In development projects new services are developed for a range of customers with the objective to commercialize these services. These development projects are the central subject of this paper.

Few authors have studied innovation activities in project-based firms. Gann and Salter (2000), who were the first to address this subject, noted that innovation activities in project-based firms are typically not executed in separate R&D departments, but performed within or closely related to business projects. Execution of development projects with the same resources as used for business activities is typical for service firms (Sundbo, 1997; Sundbo and Gallouj, 2000). Keegan and Turner (2002) have pointed out the reluctance of managers to develop innovations within business projects. Moreover, they point out that for innovations developed within business projects, the application of traditional linear project management practices have a negative impact on the success of these innovative activities.

We will demonstrate that this latter problem also applies to development projects that take place separately from business projects. Gann and Salter (2000) suggest that project-based firms could better make a more strict distinction between their generic business processes, including research and development, and business projects. At the same time they note that separating these activities will likely hamper knowledge transfer between R&D and business projects.

In this paper we focus on development projects of project-based firms. Development activities that are part of business projects are excluded, since these activities are usually customer specific and not intended for further commercialization. Moreover, the embeddedness of development activities within business projects hinders the study of the management of these activities and reduces the comparability with development projects in other firms and industries. Focusing on development projects of project-based firms makes it possible to compare new service development in project-based firms with the existing literature on new service and new product development. This approach also enables the investigation of the impact of the structure and capabilities of project-based firms on the management of development projects.

1.2. New service development

Since most project-based firms are service firms, the findings of the literature on new service development (Cooper and Edgett, 1999; De Brentani, 1989; Martin and Horne, 1993; Sundbo, 1997) apply to project-based firms. Many authors on new service development argue that differences in product and service firms' output affect the success factors for innovation. They mention in particular the intangibility and perishability of services, and the required user participation in their delivery (De Brentani, 2001; Gallouj and Weinstein, 1997). Factors that are considered more important for new service development projects than for new product development projects are: having a distinct and reliable concept (De Brentani and Ragot, 1996), synergy with the firm's current business (De Brentani and Ragot, 1996; Martin and Horne, 1993), senior management support (Cooper, 2001; De Brentani, 2001; Griffin, 1997), and customer involvement (Bowen and Ford, 2002; de Jong et al., 2003; Martin and Horne, 1993). On the other hand a structured approach would be less important (De Brentani, 2001; Griffin, 1997; Martin and Horne, 1993). However, in their meta study, Henard and Szymanski (2001) found only a few differences between success factors for new service and new project development: a higher importance of market synergy, a lower importance of a structured approach and of cross-functional teams. The higher importance of market synergy can be explained with reference to the specific character of services, since the intangibility of a service makes it more difficult to explain the advantages of a new service in advance. As a consequence the acceptance of a new service depends on the already established reputation of the firm in that specific area (De Brentani, 1989; De Brentani and Ragot, 1996). There is, however, no obvious relation between the specific character of services and the other two differences, lower importance of a structured approach and cross-functional teams.

Because of the limited results of the literature on new service development, in this paper we investigate new service development projects from a different perspective. We do not focus on the effect of the difference in what is produced, but on the effect of the organizational context. New service development in project-based firms could be quite different from what is described in the new product and service development literature, because of the different organizational structure and capabilities of these firms, compared to other service or manufacturing firms. Firstly, project-based firms deliver unique and complex services that ask for an organizational structure with less hierarchy and a higher span of control compared

to manufacturing firms (Woodward, 1980). Secondly, in project-based firms business projects are more important than the functional organization (Hobday, 2000). Often project-based firms are even organized per area of expertise, combining sales, research and production in one department dedicated to this specific area, making functional departments entirely redundant (Hobday, 2000). Thirdly, project-based organizations have unique capabilities with respect to project-management, internal collaboration and collaboration with customers and suppliers. We expect that these differences have more impact on the management of development projects, than the impact due to different idiosyncratic features in what is developed, e.g. services versus products.

We choose an exploratory approach because of the limited availability of publications on innovation management in project-based firms. Based on qualitative case-study research we develop hypotheses on success factors for new service development projects in project-based firms, compared to success factors for new product and new service development projects in other firms. We define a *success factor* as a factor that has a significant positive impact on the success of a development project and thus contributes to explaining the difference between success and failure of development projects, within a specific group of firms. Our definition of success factors does not imply that these factors are easily imitable; compliance with a factor can still be difficult. The reason to use success factors is that the innovation management literature has provided an extensive set of such factors, which facilitates the comparison between project-based firms and current literature. Secondly, these factors refer to a broad range of aspects of development projects, and therefore form a good starting point for an exploratory study (Eisenhardt, 1989). Finally, despite the exploratory character of this study, we do not want to confine ourselves to a descriptive approach only. Success factors facilitate the investigation of the effects of specific behaviours and conditions on performance within project-based firms, and thus also the development of hypotheses regarding these effects (Brown and Eisenhardt, 1995; Ernst, 2002; Montoya-Weiss and Calantone, 1994). Moreover, we address the influence of the specific structure and capabilities of project-based firms on these success factors.

2. Methodology

2.1. Sample

The four companies, in which we studied the development projects, concerned an engineering firm, an

engineering-consultancy firm, a construction company, and a financial consultancy firm. As suggested by Eisenhardt (1989, p. 537), variety in industries and size within our sample enabled us to control environmental variation, while the focus on project-based firms constrained variation due to organizational differences amongst these firms. We therefore selected different types of project-based firms. The size of these firms varied from approximately 80 employees for the financial consultant to more than a 1000 for both the engineering and the engineering-consultancy firm. Also ownership differed. One consultancy firm had a partnership structure; the other consultancy firm was a subsidiary of a firm listed on Euronext. The construction firm was family owned and two foundations owned the engineering firm.

We also constrained variation by investigating the development projects of these project-based firms and excluding innovation efforts on business projects. Each of the four firms had development projects that were executed separately from their business activities, and none of the firms had a separate R&D department. Two of the four firms had development committees to guide the firm's new service development efforts. The construction firm was renowned for its innovativeness. Within the consultancy firm development projects were well

institutionalised. The sample had a slight bias towards project-based firms with a prospector strategy (Miles and Snow, 1978), thus, towards firms that try to be ahead of the competition by being the first with new products, new technologies, or with entering new markets. The reason was that firms with a tradition of innovation appeared to be more interested to participate in this research. None of the firms operated in truly dynamic markets with frequent changes in technology. One business unit of the engineering firm was involved in the relatively dynamic market of soil cleaning, a market that in the Netherlands started in the 1980s and has been growing since.

To achieve theoretical replication (Yin, 1994), we asked each firm to select a successful and a less successful or failed project. The construction firm had only one project available for our study. One project in one of the other firms had to be skipped, as it concerned the improvement of an internal process rather than the development of a new service. The six remaining projects were all recently completed or about to be finalized (see Table 1). The sample included incremental as well as radical innovations (Garcia and Calantone, 2002): water contest was a new to the world service concept and targeted at a new market. Architecture was a new to the world concept targeted at the firm's existing market. Soil

Table 1
Case descriptions

Case	
Outsourcing	A dedicated development team of a financial consultant gathered knowledge of three outsourcing projects of this firm and combined it into one integral outsourcing concept. Experienced but mostly junior staff executed this project. The result was a successful new service. It was tested directly on a business project. The new concept made it possible to efficiently and effectively organize and execute subsequent outsourcing trajectories. Only minor refinements and adaptations had to be made to the concept, based on the experiences of the first business project.
Water Contest	A governmental prize contest was used to develop the concept of a radical new solution for water management by an engineering firm. Participation in the prize contest resulted in a nomination amongst the best five in the first round, leading to a lot of free publicity for the firm. The prize itself was not won, and the developed concept as a whole was not a business success, because it was too radical. However, the knowledge gained, the obtained publicity, and parts of the concept were considered very valuable by the engineering firm.
Soil Cleaning	An engineering firm developed, with a government grant, a new soil cleaning technology. Pilot projects were successful, but technology development is still ongoing, which delays commercialization.
Building Modules	A construction company tried to apply building modules in their construction process. They developed the concept in combination with the pre-design of two buildings as part of business projects, in order to have concrete examples. The clients of the business projects did not contribute to these development efforts. Coincidentally both business projects have been put on hold (for other reasons), which implied that the implementation of building models in the construction process was put on hold as well.
e-Business	An engineering consultancy firm developed a gearbox for the e-Business market. The initiative was taken by a group of juniors, which convinced senior management that the firm should enter the e-Business advice market on the basis of their logistic knowledge. Management was rather sceptical but agreed to fund the development project, and it gave the juniors the task to prove their concept by finding a first client. Without further guidance from senior management, the juniors developed the gearbox. Although clients had been consulted on the concept, the project team failed to find a first client. This was partly due to collapse of the internet hype in the meanwhile.
Architecture	A financial consultant wanted to create a state-of-the-art business architecture for the insurance and banking business of their clients. After a first attempt the project made a restart, but there was still little consensus about what needed to be developed. This second attempt was put on hold half-way, because another development project got priority.

Table 2
Overview of the success factors from literature

Success factors mentioned in the literature	Sources
Planning of work	
Planning and effective execution	2,5
Contingent approach	1,4
Senior management involvement	1,2,3,4,5
Team	
Cross-functional teams	1,2,4
Expertise	1,4
Heavyweight project leader	1,2
Product champion	2,4
External communication	1,2
Involvement of outside parties	
Customer involvement	1,2
Supplier involvement	1
Activities undertaken	
Pre-development	2,3,5
Market research and testing	2,3,5
Launch	4,5

Used meta-reviews: 1 = Brown and Eisenhardt (1997); 2 = Ernst (2002); 3 = Montoya-Weiss and Calantone (1994); 4 = Panne (2003); 5 = Henard and Szymanski (2001).

Cleaning was an addition to existing lines, with new to the world technology. e-Business was new to the firm, Building Modules an addition to existing services and Outsourcing was an improvement of an existing service.

For each project we interviewed at least three persons: the project leader, his or her supervisor from senior management, and one or more project members. In total we conducted 21 interviews, each about 1.5 h, which were taped and subsequently transcribed (NVivo program, Richards, 1999). The interviews were semi-structured, ensuring that at least the items listed in Table 2 were addressed. The respondents also got ample opportunity to express their views on the most important success factors in their project. During the interviews with senior management we also queried the more general characteristics of the firm, the structure of the firm and the capabilities needed to execute business projects. In addition, we studied project documentation, such as project plans, minutes of meetings, progress and final reports, in company archives.

2.2. Success factors

We derived a set of success factors from five meta-studies on new product and new service development (Brown and Eisenhardt, 1995; Ernst, 2002; Henard and Szymanski, 2001; Montoya-Weiss and Calantone, 1994; Panne, 2003), see Table 2. The meta-reviews were not

conclusive about planning of work. Some recommend a rather structured approach of planning and effective execution (Ernst, 2002; Henard and Szymanski, 2001). Others advocate a more contingent approach—planning and effective execution for incremental projects and a more organic approach for radical development projects (Brown and Eisenhardt, 1995; Panne, 2003). We have included both in Table 2. A detailed description of each factor is given in the results section. We limited ourselves to process factors, because of our focus on the organization and management of development projects. Other types of success factors, such as product features, market characteristics or price, were therefore excluded.

We defined project success by means of a multiple-criteria scale, including the following indicators (Adapted from Griffin and Page, 1996):

- Project performance: on time, within budget, quality.
- Market performances: use of service by clients, possibly as part of other services, impact on reputation of the firm.
- Learning effects for future innovation activities.

We included reputation as it appeared to be a relatively important goal for the development projects within the firms we studied (see also De Brentani, 1989). For instance, a new technology was introduced not to gain market share, but to demonstrate the firm's state-of-the-art knowledge. We had to exclude some performance criteria from the list of Griffin and Page (1996), such as the ROI rates, increase of market share, profit margins and turnover, since the project-based firms in our sample had not tracked these data for the development projects. In line with the literature, which indicates that rating success by multiple sources increases validity (Hoegl and Gemuenden, 2001; Yin, 1994), we asked three respondents – a team member, the project manager and the supervisor from senior management – to rate the project's performance.

2.3. Procedure

As a starting point we investigated for each project how the project had scored on our performance indicators, and whether the project had complied with the factors listed in Table 2. If a respondent indicated that a project did not comply we inquired after the reasons. Since most respondents worked or had worked on business projects, they could provide us with good insights in each firm's structure and capabilities, particularly as present in business projects. It was difficult for the respondents to assess whether the firm's characteris-

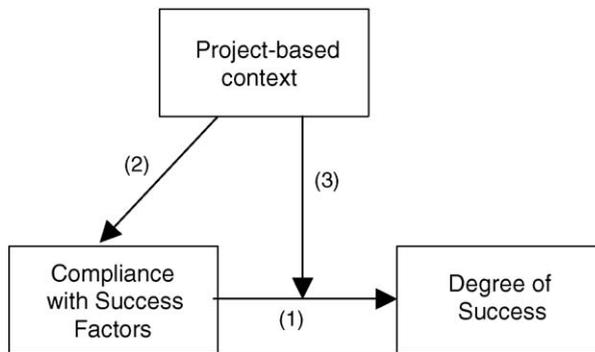


Fig. 1. The influence of the project-based context on success factors for development projects.

tics, such as the organizational structure or capabilities, affected the degree of compliance with a factor, because most respondents had no reference point other than their own firm or other project-based firms they worked for.

Next we assessed the impact of each factor on the success of each development project. This assessment was based on the discussions we had with the respondents about whether or not the factors as described in Table 2 contributed significantly to success, or upon absence were perceived as omission negatively impacting project's success. The respondents could clearly indicate whether or not a factor had been relevant for the success of their respective project. During this whole procedure we kept receptive of other potential sources of differences or similarities, in line with Eisenhardt's suggestion for exploratory case study research (Eisenhardt, 1989). Alternative explanations of our findings are addressed in Section 4.

The hypotheses regarding success factors for development projects in project-based firms are derived in two ways:

The *degree of compliance* refers to relationship (1) in Fig. 1. In the event of a relatively low compliance with a specific factor, potentially due to the structure or capabilities of the project-based firms, we hypothesize that project-based firms can improve the performance of development projects by adhering to this factor. In case the structure or capabilities of the project-based firms seemed to lead to a high degree of compliance with a specific factor, we hypothesize that such an omnipresent factor will not differentiate between successful and failed development projects, nor do we expect that additional adherence to such a factor contributes significantly to performance of development projects within this group of firms.

When our observations suggested that the firm context influenced the degree of compliance with the success

factors, we hypothesize that the project-based context affects the importance of this success factor as indicated by relationship (2) in Fig. 1.

The *need to comply* with a specific success factor refers to relationship (3) in Fig. 1. Most success factors in the innovation management literature are aimed at overcoming specific problems in a development project (for instance related to internal or external collaboration). In the event of reduced problem(s) targeted by a factor in project-based firms, we expect that the need to comply with that factor is limited and that the success factor is thus less important. On the contrary, in the case that the structure or capabilities of the project-based firms seemed to increase the problem, or led to the introduction of new problems, we hypothesize that the respective factor is more important for development projects in project-based firms compared to other firms. The need to comply is thus also expected to affect the importance of a success factor.

3. Results

Table 3 summarizes the perceived performance of the six development projects. With respect to market performance, only outsourcing was truly successful, underscoring the problems project-based firms have in exploiting new services. Five of the six projects were considered successful with respect to the project performance criteria 'on time' and 'within budget'. Only one project was said to have delivered superior quality; the quality delivered by the other projects was perceived as mediocre or even insufficient. Active promotion and positive reputation effects were evident in three of the projects. Two projects failed to capture learning effects. For the other projects, presentations were held to introduce the concept to colleagues. In one of these cases (e-Business) this knowledge transfer was ineffective, because the concept eluded the audience. In each case, there appeared to be a high degree of consensus amongst the respondents about the project's performance. Overall we classified two of the projects as successful, two as mediocre, and two as failed.

In what follows, we discuss our results by factor. We give a short description of each factor based on innovation management literature and describe how the projects in our sample complied with the success factor and to which extent compliance with the factor contributed or potentially could have contributed to the success of the development projects. Next we discuss how the context of the project-based firms influenced the compliance with each success factor and to what extent the context increased or reduced a factor's contribution to success.

Table 3
Perceived performance assessment of the projects

	Outsourcing	Water Contest	Soil Cleaning	Building Modules	e-Business	Architecture
Project performance						
Time	++	++	±	–	+	–
Budget	++	+/-	+	+	+	+/-
Quality	++	+/-	+/-	+	–	–
Market performance						
Use by clients	++	+/-	–	–	–	–
Reputation	++	++	++	-/+	–	–
Learning effects						
Exchanged knowledge with colleagues	++	++	++	+/-	–	–
Captured knowledge for future reference	++	+	++	+/-	–	–
Overall performance	++	+	+/-	-/+	–	–

Finally, we formulate hypotheses regarding the relative importance of the success factor for development projects of project-based firms, compared to development projects in functionally organized firms.

3.1. Planning of work

Cooper (2001) stresses the importance of planning and effective execution of development projects. Several authors add that overlapping phases and iteration positively affect performance, particularly in case of projects with a high uncertainty, such as radical development projects (Brown and Eisenhardt, 1997; De Meyer et al., 2002; Eisenhardt and Tabrizi, 1995).

In all our cases we found a straightforward project planning approach in development projects. The planning procedures were similar to those used in business projects, in which on-time delivery in accordance with the contractual agreements is important. The firms applied the same methods to their development projects; projects were planned sequentially and executed strictly according to these plans. As a consequence, the project leaders considered changes or delays in development projects undesirable; they even perceived changes and delays as failure. They did not apply iterative planning methods, not even in the radical projects. The experiences from the more radical cases suggest that the uncertainty in these projects made the straightforward planning ineffective. An illustrative example was the project Architecture, where the project leader forced a time boxing approach upon his team members, while it was a radical project with many uncertainties. The team failed to comply since they did not know what they should, and could deliver within each time box. This resulted in conflicts and frustrations within the team,

reducing the team's productivity dramatically. It clearly precipitated the team's downfall.

The project-based firms applied straightforward planning methods, because of their experience on business projects with this method. This core competence seemed to have become a core rigidity (Leonard-Barton, 1992), as project-based firms have difficulty to adapt to a contingent planning approach (Keegan and Turner, 2002), also for their development projects. We suspect that adherence to a contingent planning approach in accordance with uncertainty could have significantly improved performance of the development projects we studied. We therefore hypothesize that a contingent planning approach is a more important success factor for development projects for project-based firms compared to functionally organized firms.

3.2. Senior management

3.2.1. Project selection

Effective selection procedures, exemplified in the so-called funnel, contribute to the success of development projects, since weak projects are cancelled and more resources remain for the other ones (Cooper, 2001; Cooper et al., 1998; Wheelwright and Clark, 1992).

No explicit selection criteria existed for project selection in the four firms. The responsible executives, either senior managers or development committees, intuitively made approval decisions. Moreover, acceptance criteria appeared to depend on availability of employees. For example, e-Business was rejected at first, but when a few consultants 'sat on the bench' it got approved after all.

Senior management assigned a budget to each approved project. However, the resources necessary were not always made available. The development projects

competed for the same resources as the business projects, while development projects rarely got priority over business projects. This resulted in frequent changes in the composition of the development project-teams; sometimes even the whole core team had changed before the project finished. Clearly such changes had a negative impact on project performance. In spite of the resource constraints the project teams still delivered on time. Team members often worked (unpaid) overtime to meet their deadlines. Most project members did not mind the overtime, because they took pleasure in the development projects. This implied that a smaller number of registered hours were spent than expected and that most projects reported within time and budget. However, the lack of resources and the strict keeping to deadlines resulted in a decreased quality of the output. The trade-off between time and quality is mentioned in the literature (Cooper, 2001; Wheelwright and Clark, 1992), but the scale rarely tips to time above quality. This preference is especially awkward, since the firms we studied operated in rather stable markets where speed is presumed to be less important (Cooper, 2001; Eisenhardt and Tabrizi, 1995; Eppinger, 2001; Wheelwright and Clark, 1992).

In the firms with a development committee responsible for the execution of development projects, assignment of resources and budget was more in balance. In addition, we observed that in one firm more explicit project selection increased the visibility of development projects. In this firm, employees were freed from business projects during the period they were scheduled on a development project, resulting in fewer changes within the development project teams. On the contrary, the firms without a development committee executed any development project that seemed reasonable, as long as surplus resources were available. Especially in these firms the many dispersed initiatives were not always taken seriously. In most project-based firms employees will be shared between development projects and the always more urgent business projects (Sundbo and Gallouj, 2000). It is likely that explicit project selection will increase the status of development projects and as such will make it easier to free and retain resources for development projects. We hypothesize therefore that in project-based firms explicit selection of development projects is a more important success factor than in functionally organized firms.

3.2.2. *Support*

Support from senior management is a crucial success factor for development projects (Brown and Eisenhardt, 1995; De Brentani and Ragot, 1996; Wheelwright and

Clark, 1992). Such support should consist not only of tangible support as addressed above, but also of intangible support (Ernst, 2002). Senior management has to exert ‘subtle control’, by providing a vision on the targeted outcome of the project (Brown and Eisenhardt, 1995), but should not disturb the project on a daily basis or strangle the project by too much control (Bonner et al., 2002; Gersick, 1994).

Although senior management or the development committee initially approved plans for each development project, ‘subtle control’ and a vision of senior management on the contents of the projects appeared to be absent in all projects. Detailed process or end product requirements and a vision on the product as a whole were missing in the project plans. Only occasionally and mainly informally senior management was informed about progress. As one of the respondents said “I would appreciate it when they (senior managers) would inquire about the project now and then, as recognition of the work we do, but apparently they have a lot of trust in us”. At the same time, senior managers complained that they had little grasp on the projects and felt unsure about the outcome. Apparently senior management did not realize that their involvement, beyond conflict resolution, would be appreciated. Some senior managers were afraid that involvement in the contents of a development project would be interpreted as mistrust. As a consequence of the low degree of management involvement, the project teams could rather easily lower the quality of the deliverables, in order to cope with the resource limitations. Two projects in which external parties played an important role, Soil Cleaning and Water Contest, clearly differed in this respect. These projects had fixed quality objectives, and these objectives were supervised and used as yardsticks by the external parties.

The reluctance of senior management to get more involved in projects seemed to originate from business projects, in which they only interfered in case of troubles. Business projects operate completely autonomously in some project-based firms (Hobday, 2000). In all four firms, senior management was also used to delegate much authority to business project managers. This autonomy worked well for business projects, which are usually bound by contracts with clients, but the development projects without external control wandered off without additional guidance. We therefore hypothesize that within project-based firms senior management support, i.e. the provision of a clear vision on the outcome of the project (Brown and Eisenhardt, 1995), is more important for the performance of development projects than in functionally organized firms.

3.3. Team structure

3.3.1. Cross-functional teams

The innovation management literature emphasizes the importance of cross-functional teams and effective collaboration within those teams as success factors (Brown and Eisenhardt, 1995; Cooper, 2001; Cooper and Edgett, 1999; De Brentani and Ragot, 1996; Griffin, 1997; Lovelace et al., 2001; Song and Montoya-Weiss, 2001).

The core of each project team with three to four people was rather small in our sample. No functional departments (R&D, marketing, operations, sales, etc.) existed and hence the concept of cross-functional teams is irrelevant in the context of project-based firms. Within this specific structure we viewed multi-disciplinarity as the equivalent of cross-functionality. The team members of the projects we investigated were familiar with operating in multi-disciplinary teams. Collaboration amongst project members of various disciplines was in general judged as very good, also within the under-performing projects.

The project organization of the firms we studied enhanced the collaboration between different disciplines. Employees were familiar with the requirements and needs of the other disciplines and were used to collaborating. Because the level of compliance with multi-disciplinary collaboration was high in the project-based firms we studied, multi-disciplinary collaboration appeared neither a necessity, nor a differentiating factor between success and failure of the development projects. Each project benefited from the already present understanding of team members' backgrounds and disciplinary needs. We expect that multi-disciplinary collaboration is omnipresent in most project-based firms (Hobday, 2000) and consequently also exists on development project. We therefore hypothesize that in project-based firms a multi-disciplinary development team is a less important success factor compared to functionally organized firms.

3.3.2. Expertise

The availability of relevant expertise contributes to the success of development projects (Brown and Eisenhardt, 1995; Cooper, 2001; Cooper and Edgett, 1999; De Brentani and Ragot, 1996; Griffin, 1997). In many functionally organized firms a lot of attention is therefore dedicated to the provision of knowledgeable staff for development projects (Pinto and Covin, 1989).

In the cases we studied, team members were typically chosen on the basis of availability, not expertise. Ade-

quate sourcing of expertise was an important condition for success. For the project Architecture, for instance, the architecture experts were only advisers to the project team, not members. From the sideline these experts still tried to leave their mark on the project, which confused and frustrated the project team. On the other hand, the Soil Cleaning team had all expertise on board, which contributed to the effectiveness of this team. Experts were typically the driving force behind many business projects and as such only partly available for development work. Availability of expertise seemed to add significantly to the effectiveness of the development teams we observed, but was not a prerequisite for approval of development projects. Since in project-based firms employees are typically selected on the basis of availability instead of expertise (Pinto and Covin, 1989), we hypothesize that in these firms expertise is an more important success factor for development projects than in functionally organized firms.

3.3.3. Project leaders

Many scholars plea for heavyweight project leaders (Brown and Eisenhardt, 1995; Rothwell et al., 1974; Wheelwright and Clark, 1992). Wheelwright and Clark (1992, p. 195) have defined heavyweight project leaders as leaders that are capable to interpret the market, understand the multi-languages of different departments, deal with engineering issues, communicate effectively inside the team as well as outside, while guarding the concept, and resolve conflicts. They consider such heavyweight project managers important to overcome department silos and to pull a development project together. They consider a lightweight project leader to be ineffective for more radical projects, because he or she is rather a messenger than a manager (Wheelwright and Clark, 1992, p. 195).

A heavyweight project leader headed one project, Building Modules. Less experienced project leaders from middle and junior management led the other projects. Senior managers we interviewed did not complain about the ineffectiveness of project leaders, and no project leader said to have had difficulties with the above described tasks. Only conflict resolution was not their task, but their superiors'. A handicap of the use of lightweight project leaders is resource allocation. As said before, most project leaders had difficulties to get and retain resources for their development projects; not because of their limited weight, but predominantly because of low commitment of senior management (Turner, 1999). Hence, as we observed, the project leaders could rather easily accomplish their tasks; heavyweight leaders seemed to have been superfluous.

Project leaders of project-based firms are in the ‘main line of communication and can exercise control to coordinate and integrate specialists and functions in creative new ways, focusing on the needs of the projects. Because there are few internal lines of command and communication to interfere with project objectives, the internal coordination tasks become thus simpler and clearer’ (Hobday, 2000, p. 890). This also seems to hold for the tasks of a leader of a development project. We hypothesize therefore that heavyweight project leaders are less important as a success factor for development projects in project-based firms.

3.3.4. *Product champions*

The presence of a product champion is important for the promotion of an development project (Ancona and Caldwell, 1992; Brown and Eisenhardt, 1995; Rothwell et al., 1974). A product champion should preferably be the initiator of a new product and stay involved in a project throughout its life-cycle (Panne, 2003). The literature leaves open whether a project leader or someone from senior management better fulfill this role (Ernst, 2002).

In four of our projects the project leader acted as the product champion. In one project, Architecture, the product champion was someone from senior management, which appeared unsuitable. Not fully aware of all the issues going on within the development project, he pushed the project too much. For the other cases an enthusiastic, highly involved promoter of the concept within and outside the firm contributed to the credibility of each of the projects. Such a product champion was able to gain commitment of each team member. In this respect we found no indications that the role of a product champion would be different in project-based firms than elsewhere. This leads to the hypothesis that a product champion contributes to the success of development projects in project-based firms to an equal degree as in functionally organized firms.

3.3.5. *External team communication*

Ancona and Caldwell (1992) found that teams that focus their external interaction both to persuade others of the importance of a team’s work and to coordinate, negotiate, and obtain feedback from outside groups, make these teams move ahead quickly on budgets and schedule in the short term, and manage to produce the most innovative products over the course of the development process. This finding is confirmed by our more successful projects (Outsourcing, Water Contest, Soil Cleaning, Building Modules), which were actively promoted within their respective firms. Such external team com-

munication also helped to reduce resource constraints. The less successful projects lacked this kind of communication, because these project members had little to share, hence, external team communication boosts the success of already promising projects only.

Our findings confirm that external team communication is important for development projects, leading to the hypothesis that external team communication contributes to the success of development projects in project-based firms to an equal degree as in other firms.

3.4. *Outside parties*

3.4.1. *Customer involvement*

Customer involvement is essential for development projects (Brown and Eisenhardt, 1995; Ernst, 2002; Von Hippel, 1986), at least in incremental projects. In radical projects it is less important since customers cannot anticipate the problems and opportunities involved in such a product (Christensen, 1997). Customers were involved in two of our projects. In Soil Cleaning, a customer provided a testing site but had little role in the project itself. In Building Modules, a client’s building requirements of a business project was used as a blueprint. In both cases, the clients were thus hardly involved in the development activities. Outsourcing deliberately did not involve target customers; the project leader was of the opinion that the team had enough experience and insights in customer demands. The involvement of customers seemed to add little to the already known information on customer needs and demands, and as such did not seem to contribute to the success of the development projects we studied.

Close collaboration with customers is typical for business-to-business project-based firms (De Brentani and Ragot, 1996; Gann and Salter, 2000). Firms that know their customers well have less need to investigate customer needs (Maidique and Zirger, 1985). We therefore hypothesize, in line with the reasoning of Maidique and Zirger, that customer involvement contributes less to the success of development projects in project-based firms compared to functionally organized firms.

3.4.2. *Supplier involvement*

Suppliers should be involved as early as possible in development projects to improve quality and to prevent delays (Clark et al., 1987; Iansiti and Clark, 1994). In two of the development projects, early collaboration with suppliers, sharing technical know-how, was meaningful. Both these development projects were executed under the control of the respective project-based firms; thus, the suppliers were not co-producers. The respondents

perceived collaboration with suppliers as a common business procedure, since their firms already collaborated with these suppliers on business projects. The respondents indicated that supplier involvement made the development projects more complex, for instance complicating negotiations about license agreements for business projects-to-be-acquired in the future. This latter problem seemed to be closer related to the inexperience with licensing, than with difficulties related to supplier collaboration. The other projects required no supplier involvement, because the expertise of suppliers was already present, or could be developed in-house.

Project-based firms generally have extensive and close relationships with suppliers (Gann and Salter, 2000), and as we observed, the development projects made use of these existing supplier networks. Supplier obstructionism, which jeopardizes the contribution of supplier involvement to project performance (Primo and Amundson, 2002), did not seem to play a role.

From our observations it seems likely that in case supplier collaboration is needed, suppliers are indeed being involved. The level of compliance to this factor is thus high in project-based firms. We did observe that supplier involvement made the development project more complex, but according to our respondents, the added complexity did not negatively affect project performance. We did not observe that supplier involvement was a differentiating factor between success and failure, since suppliers were involved in all projects in which this was appropriate, and in the other projects we could not find indications that supplier involvement would have improved project performance. Therefore, we hypothesize that supplier involvement is a less important success factor in project-based firms than in functional firms.

3.5. *Activities undertaken*

3.5.1. *Pre-development*

In the pre-development stage, commercial and technical feasibility are investigated (Ernst, 2002), which can be used for project approval. Project selection was already discussed above, here we focus on feasibility studies; the creation of a business case.

Business cases with financial and market forecasts were lacking in five of the six projects. For one project, Architecture, the project leader made a financial forecast, based on his experience only. Although the most successful project, Outsourcing, had no business plan, and the least successful project, Architecture, contained the most elaborate business plan, we claim that a business case contributes to project performance. Not in particular related to the six projects that were subject of our

investigation, but based on the many other development initiatives within these firms that were not specifically addressed in this research; business cases could facilitate early project closure of less promising projects.

The firms in our sample had little experience in making business cases. Business projects clients typically investigate the feasibility of a project themselves. In general, the creation and approval of business plans helps to gain more realistic insight in the potential of an invention (Cooper, 2001), and also contributes to portfolio management of development projects initiatives (Roussel et al., 1991). Since project-based firms likely lack capabilities in this area, we hypothesize that creating a business case, or executing a pre-development phase, is a more important success factor for development projects in project-based firms than in functionally organized firms.

3.5.2. *Market research*

Market research is an important success factor for development projects, at least for incremental projects (Brown and Eisenhardt, 1995; Ernst, 2002; Montoya-Weiss and Calantone, 1994). Market research does not contribute to the success of more radical development projects (De Brentani, 2001; Song and Montoya-Weiss, 2001). Firms that know their customers well can rely on their gut feeling to determine the preferences of their customers (Maidique and Zirger, 1985).

The respondents had the idea that they clearly understood the preferences of their potential customers. Consequently none of the project teams performed market research. When there were doubts – as was the case in the more radical projects water contest and e-Business – some of the potential customers were contacted. For instance the e-Business team consulted two potential customers for the tool's specifications, but these same clients were not willing to buy the tool afterwards. Later, one of these clients came back with a request for a similar e-business solution. Unfortunately by that time the involved employees with the necessary e-business expertise had left the firm. For the more radical development projects market research did not seem to have added to project success, which corresponds with the findings of De Brentani (2001) and Song and Montoya-Weiss (2001).

We got the impression from our respondents that customer's needs were well understood, because of the good contacts senior managers, project leaders and team members had with potential customers. As said before, close collaboration with customers is typical of project-based firms and in general will make market research information redundant (Maidique and Zirger, 1985). Most of the new developed services never reached the mar-

ket, it was therefore difficult to assess whether or not customer needs were indeed fulfilled. In addition, as explained above, most projects lowered quality targets due to time constraints. We think that the problem of insufficient quality was not due to a lack of understanding customer needs, but in not adhering to the quality objectives set in order to meet these customer needs. We therefore hypothesize that market research contributes less to the success of development projects in project-based firms, than in functionally organized firms.

3.5.3. Testing

Another way to investigate whether a new service fulfills customer needs, is to test it (Edvardsson and Haglund, 1995; Thomke, 2003). Testing a service is more complex than testing products because it can be done only in collaboration with customers (Bowen and Ford, 2002; De Brentani and Ragot, 1996; Shostack, 1984; Thomke, 2003). Five of our projects created testable services. Only one project, Soil Cleaning, actually included intermediate testing in pilot projects, to refine and update the technology. Outsourcing was tested on the first business project and refined. In the project “water contest”, the contest was not used as a test to upgrade the concept. After the nomination the concept was slightly adapted to suit the wishes of the jury, but when the final concept was not awarded, it was not developed further to suit its potential customers.

Since market research does not seem very useful in project-based firms, testing may offer a better opportunity to adapt a new service to customer needs. Just as in other service firms, the testing phase seems to be the most appropriate moment to adapt a service to customer needs (Martin and Horne, 1993; Thomke, 2003). We hypothesize therefore that in project-based firms testing will contribute more to the success of development projects than in functionally organized firms.

3.5.4. Launch

Launch activities create awareness of a new product or service amongst target customers (Panne, 2003). De Brentani and Ragot (1996) stress that it is important that professional services are promoted to customers. “It is not enough that new service products solve client problems; their benefits must be clearly understood and perceived as superior to competitive offerings”.

Some teams considered their task completed when they had developed a concept. Few of the projects plans incorporated strategies to enter the market, whereas some projects were used to promote the firm’s reputation in general. For example the Soil Cleaning project was used to show that the engineering firm was the absolute expert

in the area of soil cleaning and capable to handle all soil pollution problems with the most recent technologies. Team members presented at conventions, seminars and workshops to promote the firm’s reputation in general, not the new service in particular.

Outsourcing promoted its new service through a workshop with a limited number of potential clients. Shortly thereafter the firm acquired the targeted number of contracts for new outsourcing projects. A respondent stated: “It is a market in which you need to make a lot of noise, to ensure that the name of your firm immediately pops up, when clients think about outsourcing”. The team noted that the firm had to avoid creating capacity problems: “These are not the type of jobs (business projects) of which we can run 5 or 6 in parallel, because especially in the implementation phase you need a large crew”. Hence, Outsourcing provides a good example of how a balanced launch campaign can be used to promote a new service without creating an over-demand.

Like business-to-business firms, also project-based firms seem to have to promote their new service more actively (De Brentani and Ragot, 1996). Such launching efforts have to be balanced to ensure that human resources can keep up with the demand. If orders cannot be executed properly, a firm’s reputation can get damaged, and for project-based firms reputation is very important (Gann and Salter, 2000). We hypothesize therefore that for development projects in project-based firms a (balanced) launch is a more important success factor than for development projects in functionally organized firms.

4. Discussion

We have investigated to which extent success factors from the new product and new service development literature can be applied to development projects in project-based firms. We excluded innovative activities on business projects, the projects performed for a specific client. We made an in-depth investigation of six cases of development projects in four project-based firms. These cases suggest that success factors frequently mentioned within the literature also apply to some extent to project-based firms. However, there are remarkable differences, both positive and negative, in the degree that these firms conform to these factors and in the importance of these factors (see Table 4). Some success factors seem to be more important for project-based firms compared to other firms: the application of contingent planning approaches, explicit project selection, senior management support, the availability of sufficient experts, making business cases and testing and launching the new

Table 4
Summary and hypothesized differences between project-based firms and functionally organized firms

Set of success factors	Compliance with factor of observed development projects	Observed contribution to success	Contextual influences	Hypothesized relative contribution to success
Planning of work				
Planning and contingent approach	No use of contingent planning approaches	Straightforward planning approach hindered especially the more radical development projects	Capabilities in straightforward planning made appliance of more contingent planning tools difficult	More important
Senior management involvement				
Project selection	Explicit project selection only in firms with development committee	Selection increased visibility and status, subsequently more resources were available	Competition for resources with more urgent business projects hindered resource allocation	More important
Support	Projects operated autonomously without much senior management support	Too much autonomy made that the projects wandered off, either in the wrong direction or toward insufficient quality	Senior management was used to give much autonomy to projects. External clients usually guard the quality of projects. This led to a low degree of senior management support for development projects	More important
Team				
Cross-functional teams	Multi-disciplinary collaboration was self evident and equally present on all six projects	Multi-disciplinary collaboration did not seem to differentiate the successful from the less successful projects	Multi-disciplinary project organization enhanced collaboration and created a high level of mutual understanding	Less important
Expertise	Experts not always sufficiently available for development projects	Absence of experts decreased performance	Competition for experts with more urgent business projects reduced their availability	More important
Heavyweight project leader	Heavyweight project leaders were rarely used	Light or medium weight project leaders were sufficient to manage the development projects	Each organization was fully geared towards the execution of projects, which facilitated the task of the project leaders	Less important
Product champion	Enthusiastic and driven individuals championed the projects and products	Product champions promoted their projects effectively	None	Equally important
External team communication	Successful projects used external communication channels to promote their projects within the firm	External promotion enhances the visibility of project (for successful projects only)	None	Equally important
Involvement of outside parties				
Customer involvement	Sufficient knowledge present within team, clients were contacted for radical development projects	Customer needs seemed well understood. Clients were not a good source of information for the more radical projects	Close collaboration with customers on business projects made that client needs were well understood, leading to a lower need to involve customers	Less important

Table 4 (Continued)

Set of success factors	Compliance with factor of observed development projects	Observed contribution to success	Contextual influences	Hypothesized relative contribution to success
Supplier involvement	When needed suppliers were involved. Collaboration with suppliers went smooth	Involvement of suppliers did not seem to differentiate the successful from the less successful projects	Development projects made use of the existing relationships with suppliers	Less important
Activities undertaken				
Pre-development	Only for one project a business case was made	Business cases will help to create more realistic expectations of development projects and can also be used for project selection	The project-based firms had little experience with making business cases	More important
Market research	No market research was done	Customer needs seemed well understood	Close collaboration with customers on business projects made that client needs were well understood	Less important
Testing	Some projects tested the new services	Testing was perceived useful to adapt the developed service to the customer needs, especially for the projects in which customers had not been involved	None	More important
Launch	Project launch not integral part of development projects	Balanced launched campaign, in which the capacity to deliver was taken into account, made the project Outsourcing successful	The project-based firms were used to wait for requests from customers for business projects. Organized launch activities were an exception	More important

services. Other factors seem to be less important: the use of cross-functional teams, heavyweight project managers, collaboration with customers and suppliers and performing market research. The involvement of product champions and external team communication seem to be equally important for the success of new service development projects compared to functionally organized firms. Characteristics of project-based firms that could explain these differences are the structure of these firms consisting of multidisciplinary departments, leading to capabilities in internal collaboration, the autonomy of the project managers relative to senior management, the guidance of business projects by clients, leading to a high priority of business projects over other activities, and the capabilities in external collaboration.

We used success factors as a reference. This approach allowed us to explore systematically the differences between project-based firms and the literature on

functionally organized firms. Distinguishing between the actual compliance on success factors and the need to comply took us away from a purely descriptive approach and facilitated developing hypotheses. Moreover, this approach stimulated a vision on innovation management that takes into account the wider firm context and the resulting requirements with respect to the organization and management of development projects.

Our paper contributes to the literature on innovation management in project-based firms, by providing insights in the management of development projects in project-based firm. Furthermore, we investigated how the organizational structure and capabilities of these firms impacted the management of the development projects. We thereby challenge the claim of Eisenhardt and Martin (2000) that success factors for innovation management are universal:

“Commonalities arise because there are more and less effective ways of dealing with the specific organizational, interpersonal and technical challenges that must be addressed. . . Just as there are better and worse ways to hit a golf ball or ski a mogul field, there are more and less effective ways to execute new product development projects”.

Instead we argue for a more contingent approach with respect to the management and organization of new product and service development activities.

Our results support some of the findings of new service development literature. For instance, Griffin (1997) found that new service development projects have fewer phases than new product development projects, particularly in underperforming firms. The omission of pre-development, market research, testing and launch activities in some of our projects supports this finding. As we indicated in the introduction, we relate the differences between project-based firms and other firms to firm characteristics, whereas authors on new service development relate their findings to the characteristics of what is produced. Our approach may provide new explanations for findings from the new service development literature. For instance, in the introduction we mentioned that Henard and Szymanski (2001) found a lower need for multidisciplinary teams in new service development activities, but that this lower need can hardly be attributed to the different character of services compared to products. We also found a lower need for multidisciplinary teams, but we relate this to the capabilities of project-based firms in internal collaboration.

4.1. Managerial implications

For managers of project-based firms our findings imply that the current innovation management literature is useful as a reference, but that the situation of their own firm requires considerable adaptation of the findings.

In accordance with the findings of (Engwall, 2003), our study shows that the management of development projects was influenced by the experience of project-based firms with business projects, which are performed in a complex but rather stable environment. It was difficult for the project-based firms to execute development projects with high uncertainty, unclear targets and lower complexity. Separating development projects from the rest of the organization leads to undesired side-effects (Gann and Salter, 2000), particularly in the form of reduced exchange of information (Griffin and Hauser, 1996). This was exactly the reason why one firm had dismantled its R&D organization in the past, and

integrated these activities within its business organization. We would therefore suggest keeping development projects close to the business activities, but explicitly applying different managerial procedures, as indicated in this paper.

5. Limitations and directions for future research

This study has several limitations. We investigated only six development projects in four firms, in which we explored the effects of capabilities on the organization and the success of development projects, and compared our findings with the innovation management literature. To confirm the generalizability of our findings future research is needed using a larger sample of development projects of both project-based and functionally organized firms. Moreover, such research can include factors not addressed in this paper, such as the effects of co-production of new services and collaboration with external parties such as research institutes.

Furthermore, we focused on the similarities between firms. There were significant differences between the four project-based firms in size, industry and ownership. We did not find effects of these differences in our study of development projects. For instance, the differences in ownership structure between the family owned firm and the subsidiary of a firm listed on Euronext were not reflected in differences in the attention of top management for innovation or on innovative performance. The larger firms had more resources available (one of the key success factors), but they did not seem to perform better in innovation.

On the other hand the variety in our sample was also limited. All firms operated in supplier-driven industries (Pavitt, 1984), did not produce extremely complex services (Hobday, 2000), they all had a prospector strategy (Miles and Snow, 1978), and operated in a rather stable environment. Future research involving more firms and more development projects will be necessary to investigate the effects of firm differences. Particularly research on project-based firms in more science-based sectors and on firms with different strategies may reveal other firm influences on success factors for innovation.

In the paper we paid little attention to differences between the six development projects regarding their technological diversity, relative importance for the firm, or size. However, it appeared that these differences did not impact the way development projects were managed. The managers were always enthusiastic, relatively young employees, who had an enormous drive to develop something new for the benefit of their firm. None of the projects were driven by customers,

nor co-produced with suppliers, albeit two projects were guided by external parties, a subsidy provider and a contest committee. The involvement of such outside parties made a difference, since these projects had a structure more in accordance with that of business projects. Further research is required to investigate the effects of differences in project characteristics.

The interplay between innovation activities on business projects and the development projects is another area for further research. As we noted in the introduction, part of the innovation activities in project-based firms is performed within business projects. An interesting issue for further research is the interplay between the experiences and outcomes of these activities and those of dedicated development projects.

A more methodological issue for future research involves the specific performance measures for development projects of project-based firms, and the appropriate respondents to measure these. The traditional success measures such as return on investments and market share (Griffin and Page, 1996) were not applicable to evaluate the success of development projects in project-based firms. For instance, our respondents considered it impossible to calculate break-even points or return on investment of development projects, since they could not determine the contribution of development projects to the acquisition of new contracts. On the other hand, contribution to the reputation of the firm appeared to be an important performance measure, since reputation is of great importance for project-based firms (Gann and Salter, 2000; Hoch et al., 2000). The common way to assess reputation is by asking respondents for the perceived contribution of a new service to the reputation of the firm in that particular area (De Brentani, 1989). The reliability of this approach may be questionable, but better measurement methods for reputation effects of individual new service development projects still have to be developed.

The exploration of these issues will enhance our understanding of the specifics of innovation management in project-based firms, and the characteristics of project-based firms in general.

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