

Business models in project-based firms – Towards a typology of solution-specific business models[☆]

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Abstract

Project suppliers are taking increasing responsibility for their customers' businesses by servicing and operating their installed base of equipment. Simultaneously, the locus in value creation in the project suppliers' deliveries and business models has changed from short-term project deliveries to also include the operation of systems. We analyze five solutions delivered by a power plant supplier firm. The term 'solution' here refers to an offering which includes a project component and an after-delivery service component. We assess the distinctive features in the business models of the solution deliveries. This paper contributes to the existing knowledge by suggesting use of solution-specific business models with six key business model elements and by developing a typology of five solution-specific business models. The typology can also be used for assessing the performance of individual solutions. Our suggestion of a solution-specific business model is especially novel in the research of integrated solutions and business models: although existing literature argues that on a general level a firm can have several business models, prior research has not suggested the use of project-specific or solution-specific business models. Therefore, our finding of solution specificity of business models contributes significantly to the existing knowledge.

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1. Introduction

A trend towards more servitized offerings and life-cycle solutions is leading to a fundamental change in business models in the capital goods businesses. For example, in the power plant business, instead of concentrating on the initial cost of plant capacity measured in €/MW, some cus-

tomers increasingly base their investment decisions on the cost of the energy produced during the plant's life-cycle, measured in €/MWh. The trend towards globalization, de-regulation and outsourcing have led to the emergence of new types of customers whose primary interest is not just the acquisition of an investment project, but the purchase of the performance of the project product during its use-phase (Ivory and Thwaites, 2003).

Integrating high-value projects in a seamless solution with a long-term operations and maintenance (O&M) service requires a project supplier to radically extend the time span of its focus from a short-term project delivery to life-cycle care (Helander and Möller, 2007). Increasingly long-term business perspectives and a change of logic in earning, present challenges for the design of a project supplier's business model and for their organizational structure (Brady and Davies, 2004; Hobday et al., 2005). Servitization in the capital goods business pushes project suppliers to

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develop and to offer total solutions that seek to reduce the capital goods' operation and maintenance costs throughout their life-cycle (Wise and Baumgartner, 1999; Ivory and Thwaites, 2003). This way, project suppliers extend their focus into the use-phase of the systems and have extensive involvement in the operation and maintenance of their installed base of systems on their customer's behalf. By occupying a larger share and responsibility of the customers' businesses, project suppliers are also given the possibility of capturing a larger portion of the overall value stream and to gain more profits (Davies, 2004). For other customers, however, the capital cost of the system is still the most important criterion in the purchase decision and they consider operation and maintenance as their core capability. In addition to the new customer types, the varied needs of the different customer segments present challenges in designing a project supplier firm's business model for its solution deliveries. In this paper, our aim is to increase the understanding on various business models in project-based firms. We address the following general-level research question:

- What different types of business models have project-based firms implemented and what are their key characteristics?

We divide this research question into three sub-questions:

- Is it possible to assess business models at the solution-level in a project-based firm?
- What are the key elements of business models on the level of a firm and on the level of a single solution?
- Is it possible to identify a typology of solution-specific business models and can such a typology be used for evaluating the business performance of solutions?

The first sub-question seeks the existence of business models on the level of single solutions. Concerning the first sub-question, we acknowledge that the current business model research discusses business models on the level of a firm. However, the literature simultaneously argues that a firm can have more than one business model for different markets and customers. Therefore, since the typical business of a project supplier firm consists of a series of unique projects and services, we find it necessary to investigate whether the business models in project-based firms are specific to the delivery of each solution. The second and third sub-questions address the content and typology of such solution-specific business models: Therefore, these sub-questions facilitate a solution-level analysis of a project supplier firm's business models.

A solution offered by a project firm is defined as including both a project component and an after-sales service component. We first analyze the literature concerning business models and suggest six key elements of a firm-level business model which are used to examine and characterize the business models at the level of a single solution that is offered by

a project-based firm. We then construct a conceptual framework for the analysis of the business model characteristics of solution deliveries. The origins of the framework is built on the ideas and conceptual structures of installed-base-related solutions as introduced by Oliva and Kallenberg (2003). However, we use Oliva and Kallenberg's (2003) work only as a point of departure, and by instating a broader conceptual analysis and synthesis of service and solution literature, we construct a framework with four types of business models for solutions that is original in its content. We then assess the key characteristics of the business models of five distinct solution deliveries within a power plant supplier firm through the use of an embedded case study. The empirical study uses the structure of the six key elements for analyzing the business models in each of the five case solutions. Based on the results of the empirical study, we conclude that the business models used in the five solutions are indeed different and specific to each of the studied solution. Based on the results, we also suggest a typology of five types of business models. The paper makes four important contributions. First, we suggest six key elements for business models. Second, we develop a typology of five solution-specific business models and present the key characteristics for each business model type. Third, through our empirical analysis we show how the typology can be used to evaluate the performance of business models. Fourth, we find the solution-specific nature – or solution specificity – of a firm's several business models, and we argue that the analysis of business models needs to take place at the solution-level rather than at the level of the firm (or its business units) as is often suggested in the existing literature.

2. The business model concept: different perspectives and key components

In general, the discussion of business models usually takes place on the firm-level (Siggelkow, 2001; Tikkanen et al., 2005; Hedman and Kalling, 2003). However, some scholars propose that the analysis of business models should not be restricted to a firm- or a business unit-level only (Slywotsky et al., 1998; Magretta, 2002; Chesbrough and Rosenbloom, 2002). Slywotsky et al. (1998) encourage firms to more carefully design their businesses for their customers, and accordingly, to be innovative in how they employ profit models. Also the conceptualizations of business models presented by Magretta (2002) and Chesbrough and Rosenbloom (2002) suggest that a firm can have several distinct business models. Building on their arguments for business models that are designed at a more detailed level, we analyze business models on a solution-level in order to propose a framework for analyzing business models that are specific for separate solution deliveries.

2.1. Perspectives on business models

Although the concept of a business model is considered useful in management vocabulary (Tikkanen et al., 2005)

and it has been studied rather extensively, there is still a lack of consensus on what comprises a business model (Magretta, 2002; Hedman and Kalling, 2003; Tikkanen et al., 2005; Morris et al., 2005). Business models build upon the theoretical traditions of business strategy in an effort to combine the different views on strategy and the relationship of a firm's strategy and performance (Morris et al., 2005; Hedman and Kalling, 2003; Chesbrough and Rosenbloom, 2002), especially in an effort to combine the perspectives of industrial organization (Porter, 1980), a resource-based view (e.g., Peteraf, 1993; Wernerfelt, 1989, 1995) and strategy process (e.g., Chakravarthy and Doz, 1992; Mintzberg, 1978). Use of business models as a research tool has raised some criticism (Porter, 2001) but many still consider business models as useful tools for analyzing the characteristics of a firm's business (Hedman and Kalling, 2003). Although closely related, business models differ from business strategy in that a business model assumes that a manager's knowledge is cognitively limited (Chesbrough and Rosenbloom, 2002; March and Simon, 1958); cognitive limitations are significant and managerial action may be biased by the earlier success of the firm (Hedman and Kalling, 2003; Siggelkow, 2001; Tikkanen et al., 2005). Additionally, whereas strategy emphasizes competition, business models build on creating value for the customer (Morris et al., 2005). From a different perspective, the term business model is often used for describing the underlying logic for a supplier's revenue and profit generation (Slywotsky et al., 1998; Magretta, 2002; Morris et al., 2005).

2.2. The role of value creation and value capture in business models

A business model addresses both value creation for the customer (Vargo and Lusch, 2004; Ulaga, 2003; Normann, 2001) and value capture for the supplier (Walter et al., 2001; Möller and Törrönen, 2003). Most conceptualizations of business models build on value creation for the customer (Chesbrough and Rosenbloom, 2002; Morris et al., 2005; Magretta, 2002). Slywotsky et al. (1998) discuss business designs and profit models, which effectively describe a number of basic level economic models that

firms can innovatively employ and combine to create a profitable business. This is in line with the suggestions of Oliva and Kallenberg (2003). According to the installed base service typology by Oliva and Kallenberg (2003), the installed base service types are determined by two axes: customer value proposition (for value creation), and supplier's pricing logic (for value capture and revenue generation).

2.3. Synthesis on the business model elements

Based on the literature review of business models, we identified six key elements of a business model (Table 1): (1) customer, (2) value proposition for the customer, (3) competitive strategy, (4) position in the value network, (5) suppliers' internal organization and its key capabilities and (6) logic of revenue generation. We use these six key elements of a business model (see Table 1), to analyze literature in order to characterize the different business models for solutions and to create a conceptual framework of solution-specific business models (in Section 4). We then use the six elements in the empirical analysis and develop a typology of solution-specific business models (in Section 6).

3. The effect of servitization on project suppliers' business models

In order to construct the framework of solution-specific business models, we need to first explore the factors that have pushed project-based firms to offer solutions that combine project delivery and a life-cycle-focused after-delivery service. To describe the service orientation in traditional manufacturing businesses, we refer to "servitization" of business, a term that was first introduced by Vandermerwe and Rada (1988) and has been widely-adopted (e.g., White et al., 1999; Rothenberg, 2007). Servitization is defined as a trend in manufacturing to offer for integrated bundles, or both solutions and operational services in the value stream (Davies, 2004; Davies et al., 2006). These integrated solutions are bundled offerings of goods, services, knowledge support and a customer's self-service (Vandermerwe and Rada, 1988). Firms that suffer from commoditization and sinking prices have been

Table 1
Six key elements of a business model.

Business model elements	Literature source
Customers	Chesbrough and Rosenbloom (2002), Hedman and Kalling (2003), Magretta (2002), Morris et al. (2005) and Tinnilä (2007)
Value proposition for the customer	Chesbrough and Rosenbloom, (2002), Magretta (2002), Morris et al. (2005) and Tinnilä (2007)
Competitive strategy	Chesbrough and Rosenbloom (2002), Hedman and Kalling (2003), Morris et al. (2005), Tikkanen et al. (2005) and Siggelkow (2001)
Position in the value network	Chesbrough and Rosenbloom (2002), Hedman and Kalling (2003), Tikkanen et al. (2005) and Tinnilä (2007)
Supplier's internal organization and its key capabilities	Normann (2001), Hedman and Kalling (2003), Morris et al. (2005) and Tikkanen et al. (2005)
Logic of revenue generation	Slywotsky et al. (1998), Chesbrough and Rosenbloom (2002), Hedman and Kalling (2003), Magretta (2002), Morris et al. (2005) and Tikkanen et al. (2005) and Tinnilä (2007)

encouraged to concentrate on delivering high-value services combined with their products to form solutions that fulfill their customers’ needs (Wise and Baumgartner, 1999; Galbraith, 2002; Davies, 2004; Mathysens and Vandenberg, 2008). Servitized offerings are needed because customers in their purchasing decisions increasingly focus on the life-cycle costs of the system and the system’s performance in their process (Stremersch et al., 2001; Helander and Möller, 2007; Nordin, 2004). Therefore, they request for a more long-term commitment. In order to effectively compete with integrated, servitized offerings, suppliers need to adopt a service-dominant logic (Vargo and Lusch, 2004; Lusch and Vargo, 2006) and they need to take a holistic view towards businesses (Vandermerwe and Rada, 1988). Successful firms build relationships with their customers and focus on the utilization of their products instead of traditional manufacturing activities and short-term transactions (Normann, 2001). The emphasis on the solutions’ use-phase performance illustrates how servitization blurs the distinction between manufacturing and service activities (White et al., 1999). Our view on solutions is derived from the servitization. A solution here includes a project component and a service component that either can be offered separately or as a whole (life-cycle focused integrated offering). Therefore, in the following we use the above views on servitization for the construction of the framework of solution-specific business models.

4. Conceptual framework for analyzing solution-specific business models

In this section we develop a framework for the analysis of a project supplier’s business models for delivering solutions. Our framework has origins in the servitization model presented by Oliva and Kallenberg (2003) and we use its

two dimensions, the value proposition for the customer and the revenue generation logic for the supplier as a starting point. We develop it further (see Fig. 1 and Table 2) to address the life-cycle view of solutions (cf. the project delivery component and after-delivery service component) by simultaneously including the six key elements of a business model that are depicted in Table 1. In this way, we analyze and explain the business model characteristics of individual solutions.

According to Oliva and Kallenberg (2003) a firm’s revenue generation logic can either be based on providing transactional product services or on relationship-based services (Oliva and Kallenberg, 2003). The move into relationship-based services requires a change in pricing and revenue generation logic from a markup in labor and parts to fixed pricing based on equipment availability (Oliva and Kallenberg, 2003). Consequently, the supplier accepts some of the customer’s operational risks and introduces value-based pricing for the service (Sawhney, 2006). The other dimension of Fig. 1 displays the offering for either product-oriented or process-oriented services and implies a change in customer value proposition from product efficacy to product’s efficiency in the user’s process. Process-oriented services support the customer in getting the best use of the system (Mathieu, 2001; Markeset and Kumar, 2003a,b, 2004). The last step, taking over the end-users operations, requires the supplier to assume operational risk and to take the responsibility of the end-users process (Oliva and Kallenberg, 2003). Gebauer (2008) develops the typology by Oliva and Kallenberg in his identification of service strategies for manufacturers. He finds that customers who outsource their operations to suppliers often have a strong interest in reducing their initial investment and therefore outsourcing-type of services are rather standardized and product-oriented. Instead, providers of

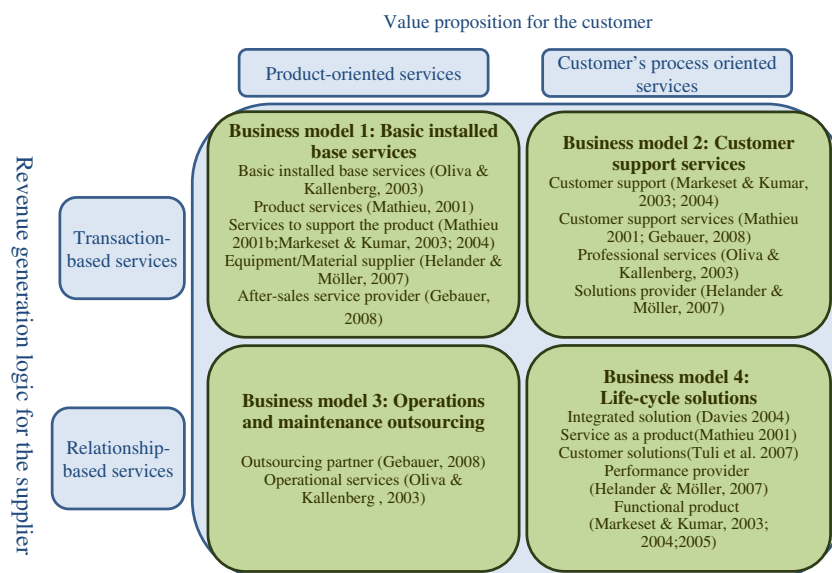


Fig. 1. Framework of a project supplier’s business models for solutions.

Table 2
The characteristics of solution-specific business models.

	Business model 1: Basic installed base services	Business model 2: Customer support services	Business model 3: Operations and maintenance outsourcing	Business model 4: Life-cycle solutions
Customers	Independent strategy and in-house technological know-how (Helander and Möller, 2007; Markeset and Kumar, 2003a)	Strong or weak capabilities, will to share supplier's know-how (Helander and Möller, 2007)	O&M non-core process, will to outsource for flexibility (Oliva and Kallenberg, 2003; Windahl et al., 2004; Gebauer, 2008)	Rely on supplier's expertise, will to engage in long-term relationship (Davies, 2004; Windahl et al., 2004; Penttinen and Palmer, 2007)
Value proposition	Assistance and spare-parts to ensure proper functioning of the system (Markeset and Kumar, 2004; Gebauer, 2008)	Efficiency of the of the project product in customer's process (Mathieu, 2001; Oliva and Kallenberg, 2003; Gebauer, 2008)	Reduction of initial investment and guaranteed operational cost (Gebauer, 2008)	Co-development of solution that offers best performance and outcome (Vargo and Lusch, 2004; Davies, 2004; Davies et al., 2006)
Competitive strategy	Price competition and quick service delivery (Stremersch et al., 2001; Cohen et al., 2006; Gebauer, 2008)	Customer support for complex systems, reputation of quality and technological superiority (Markeset and Kumar, 2004; Gebauer, 2008; Wikström et al., 2009)	Cost leadership on operational cost, standardization (Gebauer, 2008)	Differentiation and pro-active co-creation of customer's requirements (Davies et al., 2006; Crespin-Mazet and Ghauri, 2007)
Position in the value network	Network of third party service suppliers, services non-core business (Cohen et al., 2006; Helander and Möller, 2007)	Intimate customer relationship, no network suppliers (Cohen et al., 2006; Helander and Möller, 2007)	OEM's often use network service companies that offer limited customization (Oliva and Kallenberg, 2003; Windahl et al., 2004; Davies, 2004)	Large share of value stream, role of external partners and network of customers (Davies, 2004; Windahl et al., 2004; Cova and Salle, 2008)
Internal organization and capabilities	Separate service unit with P&L responsibility to promote importance (Oliva and Kallenberg, 2003; Helander and Möller, 2007)	Replicate professional service capabilities, sales channels to higher management level, know-how of customers' business (Stremersch et al., 2001; Oliva and Kallenberg, 2003; Markeset and Kumar, 2004)	Localization and centralization of tasks, service capacity utilization (Oliva and Kallenberg, 2003; Helander and Möller, 2007)	Customer-facing units, strategic role of marketing, business/ market competencies, solution repeatability (Krishnamurthy et al., 2003; Vargo and Lusch, 2004; Davies et al., 2006)
Logic of revenue generation	Transactional revenue, possibility of installed base profits (Slywotsky et al., 1998; Markeset and Kumar, 2005; Cohen et al., 2006)	(Differentiated high-margin service, performance guarantee, transactional Oliva and Kallenberg, 2003; Sawhney, 2006; Gebauer, 2008)	Accepting operational risk worth premium, revenue sharing possible (Oliva and Kallenberg, 2003; Sawhney, 2006)	Gain-sharing, performance guarantees, solution profits, pricing on second-best options (Slywotsky et al., 1998; Davies et al., 2006; Sawhney, 2006)

process-oriented customer support services and development services perform best with a service and product differentiation strategy as they operate in markets with less competition.

We adopt the following framework dimensions; value proposition for the customer, and pricing, or revenue generation logic, for the supplier from [Oliva and Kallenberg \(2003\)](#) for the conceptual framework on business models for solutions. However, we emphasize the life-cycle view of solutions in order to create long-term value for both the customer and the supplier ([Davies, 2004](#); [Tuli et al., 2007](#); [Krishnamurthy et al., 2003](#)). These considerations relate to the type of business model for life-cycle solutions which is placed in the lower right corner in our conceptual framework ([Fig. 1](#)). Life-cycle solutions are distinctively different from standardized, product-oriented operations outsourcing ([Gebauer, 2008](#)). Therefore, operations and maintenance outsourcing-type of business model is located on the lower left corner in our framework. The four distinctive solution-specific business models with an emphasis on a rich body of service and solution business sources are summarized in [Fig. 1](#). Based on the literature analysis and on the constructed framework of a project supplier's business models for solutions ([Fig. 1](#)), we conclude that the elements of the four solution-specific business models retain the key characteristics that are presented in [Table 2](#).

5. Research method and the case company

In order to assess potential differences in solution-level business models and their characteristics, we collected empirical data following a single embedded unit case study method ([Yin, 1990](#)). Embedded unit case study design was considered to be appropriate for an in-depth understanding of the detailed characteristics and of the potential differences in various business models that a firm uses in its solution deliveries. In addition, research on business models at a solution-level is still in its exploratory stage and existing knowledge on components of business models at the solution-level is rather scarce. Furthermore, an embedded unit design is advantageous because it allows for an amount of control over the number of external effects that influence the characteristics of business models.

The firm under analysis is Consolidated Power Company (CPC, a pseudonym), a multinational power company with annual sales of around 4000 million Euros. CPC is a multi-business company but this research focuses on its power plant supplier business. The supplier's power installation projects are flexible, ranging from simple equipment deliveries to full-scale turn-key deliveries. The company also offers an extensive service portfolio for its power systems, including operational services and life-cycle care. In operations and maintenance (O&M) services, the O&M unit can manage all aspects of the operation and maintenance of a power installation. The scope of the O&M contract is tailored according to a customer's needs. Thus, CPC operates in several parts of the capital goods'

value stream ([Davies, 2004](#)), manufacturing, integrating and operating power plants. Five solutions were selected for analysis in this research. The components of the five solutions that we analyze all include an engineer, procure, construct (EPC) – project delivery followed by a long-term O&M service contract ([Fig. 2](#)). Such project and service components are analogous to the “systems integration” and “operational services” stages in the value stream of integrated solutions proposed by [Davies \(2004\)](#). In four of the solutions, the customer was first offered and sold a power plant project that was based on the customer's specifications in the EPC project tender. In these four solutions, the O&M contract was offered separately after the EPC project was offered ([Fig. 2](#)). For the purpose of the paper, this solution type, due to its disintegration of the two solution components (project and O&M service in the use-phase) is defined as a project-led solution. A project-led business model was also used in its delivery. The fifth solution in the sample was a solution with a seamless offering for the customer, consisting of an integrated EPC project and O&M service. This solution type is defined as a life-cycle-led solution. Accordingly, we use the term life-cycle-led business model when referring to the business model with this solution type.

The solutions are introduced in [Table 3](#). For the purpose of anonymity, the project-led solutions have been named based on the primary purpose of the electricity production. One of the solutions represents a life-cycle-led solution where CPC was proactive in developing the project for the customer, while the four other solutions represent the more common project-led solutions, where the solution delivery process is started with project sales responding to a customer's request for a tender. The life-cycle solution is called the “Development solution” in order to emphasize CPC's special role in developing it. We concluded that the customers for the five solutions include those that can be categorized as representative of customers for three distinctive customer segments: independent power producers, captive customers, and state utility customers.

In order to assess the business model in each of the solutions, multiple sources of data were used. Altogether 15 interviews were conducted. The interviewees represent various positions in the organization including EPC project managers, O&M service sales managers and regional O&M contract managers for each solution. The interviews were semi-structured, ten of them in person and five over the phone. Interview topics focused on the value proposition and customer needs in the solution's sales phase, internal organization of the solution delivery, value creation

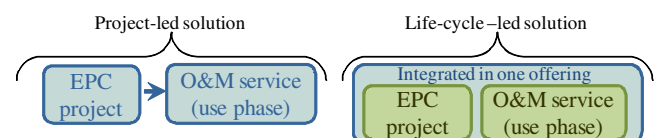


Fig. 2. Project-led solution and life-cycle-led solution.

Table 3
Key information on the five solutions.

Solutions	EPC project scope	O&M service scope	Customer segment	Solution type
Solution 1: metal industry solution	102 MW	10-year O&M agreement	Captive customer = Industrial user of electricity	Project -led solution
Solution 2: Construction Industry solution	40 MW	7-year O&M agreement	Captive customer = Industrial user of electricity	Project-led solution
Solution 3: Co-Generation solution	10 MW of electricity and heat capacity	12-year O&M agreement	Independent power producer = A group of investors	Project-led solution
Solution 4: Base Load solution	102 MW	2-year O&M agreement	State utility	Project-led solution
Solution 5: Development solution	1. Project development 2. Integrated delivery: 74 MW and 15-year O&M agreement		State utility and Independent power producer	Life-cycle-led solution

and capture, and the solution's performance. The interviews lasted for about 45–60 min each. The face-to-face interviews were tape-recorded and transcribed. Detailed notes were taken during the telephone interviews. Additionally, company internal material and customer satisfaction survey data were analyzed in order to gain insight into the solutions and to understand the different factors that play a role in successful business models.

6. Analysis of the business models of the five solutions

In this section we describe the results of the analysis on the business models of the five solutions. We used the data to identify and analyze in detail the contents of the six key business model elements of each of the five solutions. Moreover, we compared the characteristics of the solutions that were delivered to the same customer segments with the characteristics of those solutions that were delivered to another customer segment. This was because, based on the interviews, customer segment had been perceived as an important factor in the selection of the business model for a solution. The synthesis of the distinctive business model characteristics in each of the five case solutions based on the analysis, is provided in Table 4.

Table 4 distinguishes between different customer segments, and it compares the six key elements of the business models in the five solutions. The last row of Table 4 indicates the business model type for each of the solutions. Based on the results of the analysis, we refined the original conceptual framework by dividing business model 4 (Life-cycle solutions) into two separate business models; 4a: "Delivery of life-cycle solutions" and 4b: "Development of life-cycle solutions", (see Fig. 3) that are both included in type 4 ("Life-cycle solutions") (see Fig. 3). The main difference between these two business model types is the supplier's revenue generation logic: the Development solution had more upfront costs and required more extensive business, market and stakeholder management capabilities (Krishnamurthy et al., 2003; Windahl et al., 2004). The Development solution also accepted more risk in the development phase (e.g., Tam, 1999) than the delivery of life-cycle solutions. The Development of life-cycle solutions –

business model employs an organizational model that is led by a separate customer-facing team, as suggested by Davies et al. (2006) and Krishnamurthy et al. (2003). By contrast, in the business model for the Delivery of life-cycle solution the design of the solution was instead handled by a proactive marketing department that promotes the life-cycle aspect of the solution while the actual delivery was organized by separate project and service units (Oliva and Kallenberg, 2003; Galbraith, 2002). Based on these considerations, the four-type conceptual framework is expanded to a typology of the five types of business models (Fig. 3).

Furthermore, the analysis allowed us to place the five solutions into the framework and to further analyze their performance. We indicated the under-performing solutions with arrows that point to more appropriate business models that may have led to greater performance. The performance considerations of the five solutions are explored in the next section.

7. Performance of the solutions

We concluded that in the five empirical solutions, both project-led and life-cycle-led solutions shape the traditional project-based method of business, significantly changing the locus of value creation (Vargo and Lusch, 2004; Ulaga, 2003; Normann, 2001) and value capture for the supplier (Walter et al., 2001; Möller and Törrönen, 2003) from the project delivery to the long-term service contract. However, the solutions that used the operations and maintenance outsourcing-business model (the Co-Generation, the Base Load and partially the Metal Industry solutions, see Fig. 3) were under-performing, while the solutions that used the Delivery or the Development of life-cycle solutions–business model (the Development and the Construction Industry solutions) performed extremely well. We found that the Construction Industry solution and in particular the Development solution utilized the synergies that were created when offering a life-cycle-led solution. Early involvement of both the project and O&M sales teams in the development of a solution to meet the customer's needs allowed CPC to form a value proposition that was based

Table 4
 Characteristics of the business models used in the five solutions.

	Metal Industry solution	Construction Industry solution	Co-Generation solution	Base Load solution	Development solution
Customer	Captive customer	Captive customer	Independent power producer	Utility customer	State utility and Independent power producer
Value proposition	<ul style="list-style-type: none"> – Securing of undisturbed production – Full outsourcing of electricity production – Credibility in service 	<ul style="list-style-type: none"> – Guaranteed electricity production with fixed cost = comfort – Full outsourcing of electricity production – Credibility in service 	<ul style="list-style-type: none"> – High IRR from project and outsourcing of risks 	<ul style="list-style-type: none"> – Fast delivery of additional capacity – Transfer of know-how in gas-engine operation vs. high-quality asset management 	<ul style="list-style-type: none"> – Reliable new capacity with low life-cycle energy cost – Ability to develop and deliver – Low-risk IRR from project
Competitive strategy	<ul style="list-style-type: none"> – Technological superiority – Customer's low skills in operation 	<ul style="list-style-type: none"> – Relieve the customer from dealing with technology – Customer's low skills in operation 	<ul style="list-style-type: none"> – Low life-cycle service cost – High performance guarantees given 	<ul style="list-style-type: none"> – Low cost of plant – Customer's need for training for new technology 	<ul style="list-style-type: none"> – Track record of references – Lowest bid for utility – Better knowledge on solution risks
Position in the value network	<ul style="list-style-type: none"> – Manufacturing of key components, systems integration of plant – O&M crew trained from the customer's employees 	<ul style="list-style-type: none"> – Manufacturing of key components, systems integration of plant – Local O&M crew 	<ul style="list-style-type: none"> – Manufacturing of key components, systems integration of plant, local O&M crew – State utility dominated the value network 	<ul style="list-style-type: none"> – Manufacturing of key components, systems integration of plant – Short involvement in O&M, possible expert services after initial term 	<ul style="list-style-type: none"> – Main developer = initial customer – Manufacturing of key components, systems integration of plant, local O&M crew
Internal organization and capabilities	<ul style="list-style-type: none"> – Proactive approach in marketing – EPC-led sales & delivery process – Few O&M requirements addressed in commissioning – Flexibility in project management 	<ul style="list-style-type: none"> – Proactive approach in marketing – Balanced sales process – EPC-led design – Emphasis on project quality – Good formulation of the value proposition – Repeatability of O&M process 	<ul style="list-style-type: none"> – Request for a bid for a life-cycle solution – EPC-dominant delivery process – Little communication between project & O&M units – O&M know-how 	<ul style="list-style-type: none"> – Request for a bid for EPC & O&M – EPD-dominant sales & delivery process – Communication problems in hand-over – Global, standard processes in project & O&M 	<ul style="list-style-type: none"> – Proactive development for IPP customer – Development -led process – Balanced formulation of the solution – Risk management capabilities and flexibility – Technology know-how
Logic of revenue generation	<ul style="list-style-type: none"> – Timely project delivery – O&M mobilization fee – Fixed O&M fee with two price components – Performance guarantees 	<ul style="list-style-type: none"> – Timely project delivery – O&M mobilization fee – Fixed O&M fee with two price components – Performance guarantees – Diversification to operate also other technologies 	<ul style="list-style-type: none"> – Timely project delivery – O&M fixed fee – Technical problems caused under-performance – Bonus on high performance possible 	<ul style="list-style-type: none"> – Project completion delayed – Performance guarantees – Less service income due to problems in project completion 	<ul style="list-style-type: none"> – Development fee – Shares/dividends of project company – Timely project delivery – O&M mobilization fee – Fixed O&M fee with two price components – Bonus on high performance possible
Business model of the solution	Delivery of life-cycle solution/ operations and maintenance outsourcing	Delivery of life-cycle solution	Operations and maintenance outsourcing	Operations and maintenance outsourcing	Development of life-cycle solution

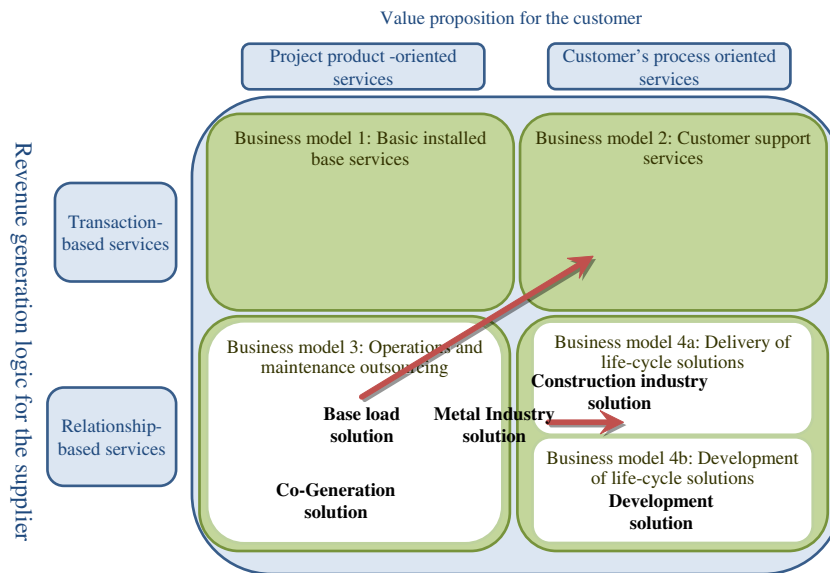


Fig. 3. Typology of five solution-specific business models.

on the solution's life-cycle cost (€/MWh) and to secure the sales of a total life-cycle solution at an early phase. In the Development solution, this opportunity even led further to the development of a business case for the customer, which allowed for the development and delivery of an integrated life-cycle-led solution for the customer.

By contrast, in the Base Load and the Co-Generation solutions, the customers were sold only what they had asked for, without careful consideration for the implications for the customer's or for CPC's own value-creation processes. This resulted in a poor external fit of business model elements (Siggelkow, 2001) and offering of solutions that did not fit the customer's strategy (Helander and Möller, 2007). The arrows in Fig. 3 indicate a desirable shift for the Base Load and the Co-Generation solutions from their existing business models towards another business models that would have provided both the customer and the supplier with a better overall performance in terms of life-cycle service cost, revenue and quality. In these two solutions, a concentration on the project product delivery and compromise in long-term performance in the value proposition adversely affected both the service quality and service revenue stream.

On the other hand, the Construction and the Development solutions managed to proactively anticipate the customer's need and to create solutions that delighted the Construction Industry and the Development solution customers. These solutions seem to be more successful because they concentrated the value proposition to the customer's process (Oliva and Kallenberg, 2003; Normann, 2001) and could define an appropriate scope for the life-cycle solution. The contrast between high-performing and under-performing solutions indicates that a supplier sometimes needs to go beyond the customer's expressed needs in order to find the best solution for the customer and also to guarantee itself the best performance from the solution.

8. Conclusion

This paper focused on analyzing business models used for delivering solutions. The analysis points out several important findings. Rather than analyzing business models on a firm-level as in most of the prior work on business models, we suggest that project suppliers do in fact employ a number of different solution-specific business models. Therefore, project supplier firms' business models should be analyzed on a solution-level. We analyzed five solutions that a power plant supplier firm delivered to its different customers. Each of the solutions included an offering of a project component (EPC project) and an after-delivery service (O&M) component. Since each project is unique even by definition, and a project-based firm's solution business is built on unique project deliveries, the solutions are also unique. Indeed, a typical business within the case firm is comprised of unique solution deliveries. We used six business model elements to point out the differences between the business models for the five solutions. We constructed a conceptual framework for business models at the solution-level with four types of business models, and based on the empirical study, we refined the framework to a typology of five solution-specific business models. Our analysis suggests that the business models in project-based firms should be analyzed at the level of individual solutions, instead of only at the firm- or business unit-level as is largely assumed by business model research (Hedman and Kalling, 2003; Morris et al., 2005; Tikkanen et al., 2005). Indeed, finding the solution specificity of business models in project-based firms is a significant contribution to the existing knowledge.

Finally, we show through our empirical analysis how the typology can be used to evaluate the performance of business models. We recognized that the most successful solution deliveries seem to focus on enhancing the

solution's performance in the customer's own value creation process. Also according to existing literature, the choice of the business model for the solution delivery must be adapted to the customer's strategy (Helander and Möller, 2007; Kujala et al., 2008). Furthermore, the disintegration of the project and the service delivery units and the reactive marketing approach led to product-centric value propositions that hindered the efficient solution delivery and decreased the case firm's ability for value creation both for itself and for the customer. The problem was related to the product-centricity of organization as is discussed by Galbraith (2002) and Tuli et al. (2007). More careful consideration of the customer's strategy and long-term business needs, as well as the supplier's own revenue generation logic and internal capabilities could have resulted in a more cost-efficient and high-quality life-cycle offerings with the use of different business models.

9. Discussion and further research

The servitization of the capital goods businesses and the business models used by project supplier firms to address their customers' calls for increased life-cycle orientation have received fairly little attention among academics. Prior research offers plenty of allusions to the advantages and disadvantages of solution provision but there is a clear lack of research that looks into servitized business models in capital goods supplier firms. In addition, most existing business model literature concentrates on firm-level business models.

This paper provides a typology for assessing business models for solutions in project-based firms. This paper also suggests six key elements of a solution-specific business model, and presents an analysis of the content of the business models and their key characteristics in five empirical case solutions. Furthermore, based on the analysis we developed a typology of five solution-specific business models. The five business model types are: The basic installed base services, the customer support services, the operations and maintenance outsourcing, the delivery of life-cycle solutions and the development of life-cycle solutions. One of the main outcomes of this research is the observation that there is a solution-specific nature – or solution specificity – to business models. A solution includes a project component and an after-delivery service component, and the related offering is comprised of these two components as separate parts (project-led solution) or as an integrated whole (life-cycle-led solution). We looked at project development from a business perspective, which is rarely done in the existing literature. Our analysis also provides evidence of how concentrating the solution's value proposition on its use-phase helps to align the supplier's and the customer's interests and creates synergies that allow a supplier to gain higher profits, and to provide its customers with services that enhance the customer's own business performance.

This research provides ideas for future research. Our finding regarding the solution specificity of business models in particular opens avenues for further research as follows:

- Is the suggested typology of solution-specific business models valid in other project-based firms or industries?
- Are there interactions and coexistence of the solution-level and the firm-level business models in project-based firms?
- What are the contextual factors or the drivers and barriers that affect the *choice* of the business model in a project-based firm?
- What are the factors that affect a delivered solution's *performance* during its life-cycle?

References

- Brady, T., Davies, A., 2004. Building project capabilities: from exploratory to exploitative learning. *Organ Stud.* 25, 1601–1621.
- Chakravarthy, B.S., Doz, Y., 1992. Strategy process research – focusing on corporate self-renewal. *Strat. Manage. J.* 13, 5–14.
- Chesbrough, H.W., Rosenbloom, R.S., 2002. The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Ind. Corporate Change* 11, 529–555.
- Cohen, M.A., Agrawal, N., Agrawal, V., 2006. Winning in the aftermarket. *Harvard Bus. Rev.* 84 (5), 129–138.
- Cova, B., Salle, R., 2008. Marketing solutions in accordance with the S-D logic: co-creating value with customer network actors. *Ind. Mark. Manage.* 37, 270–277.
- Crespin-Mazet, F., Ghauri, P., 2007. Co-development as a marketing strategy in the construction industry. *Ind. Mark. Manage.* 36, 158–172.
- Davies, A., 2004. Moving base into high-value integrated solutions: a value stream approach. *Ind. Corporate Change* 13, 727–756.
- Davies, A., Brady, T., Hobday, M., 2006. Charting a path toward integrated solutions. *MIT Sloan Manage. Rev.* Spring, 39–48.
- Galbraith, J.R., 2002. Organizing to deliver solutions. *Organ Dynam.* 31 (Autumn), 194–207.
- Gebauer, H., 2008. Identifying service strategies in product manufacturing companies by exploring environment-strategy configurations. *Ind. Mark. Manage.* 37, 278–291.
- Hedman, J., Kalling, T., 2003. The business model concept: theoretical underpinnings and empirical illustrations. *Eur. J. Inf. Syst.* 12, 49–59.
- Helander, A., Möller, K., 2007. System supplier's customer strategy. *Ind. Mark. Manage.* 36, 719–730.
- Hobday, M., Davies, A., Prencipe, A., 2005. Systems integration: a core capability of the modern corporation. *Ind. Corporate Change* 14, 1109–1143.
- Ivory, C., Thwaites, A., Vaughan, R., 2003. Shifting the goal posts for design management in capital goods projects: 'design for maintainability'. *R&D Manage.* 33 (5).
- Krishnamurthy, C., Johansson, J., Schlissberg, H., 2003. *Solutions Selling: Is the Pain Worth the Gain?* McKinsey Marketing Solutions.
- Kujala, J., Artto, K., Parhankangas, A., 2008. Factors influencing design and performance of the business model of a project-based firm. *Proj. Perspect.* 2009, 14–27.
- Lusch, R.F., Vargo, S.L., 2006. Service-dominant logic: reactions, reflections and refinements. *Mark Theory* 6 (3), 281–288.
- Magretta, J., 2002. Why business models matter. *Harvard Bus. Rev.* 80 (5), 86–92.
- March, J.G., Simon, H.A., 1958. *Organizations*. Wiley, New York.
- Markeset, T., Kumar, U., 2003a. Design and development of product support and maintenance concepts for industrial systems. *J. Qual. Maint. Eng.* 9 (4), 376–392.

- Markeset, T., Kumar, U., 2003b. Product support strategy: conventional versus functional products. *J. Qual. Maint. Eng.* 11, 53–67.
- Markeset, T., Kumar, U., 2004. Dimensioning of product support: issues, challenges, and opportunities. In: Paper Appears in IEEE Reliability and Maintainability, 2004 Annual Symposium – RAMS, January, Los Angeles.
- Markeset, T., Kumar, U., 2005. Product support strategy: conventional versus functional products. *J. Qual. Maint. Eng.* 1, 53–67.
- Mathieu, V., 2001. Product services: from a service supporting the product to a service supporting the client. *J. Bus. Ind. Mark.* 16 (1), 39–58.
- Mathysens, P., Vandenbempt, K., 2008. Moving from basic offerings to value-added solutions: strategies, barriers and alignment. *Ind. Mark. Manage.* 37, 316–328.
- Mintzberg, H., 1978. Patterns in strategy formation. *Manage. Sci.* 24, 934–948.
- Möller, K., Törrönen, P., 2003. Business suppliers' value creation potential: a capability-based analysis. *Ind. Mark. Manage.* 32, 109–118.
- Morris, M., Schindehutte, M., Allen, J., 2005. The entrepreneur's business model: toward a unified perspective. *J. Bus. Res.* 58, 726–735.
- Nordin, F., 2004. Managing the process of adopting service logic in collaboration with suppliers. *J. Change Manage.* 4, 339–350.
- Normann, R., 2001. *Reframing Business: When the Map Changes the Landscape*. Wiley, Chichester, UK.
- Oliva, R., Kallenberg, R., 2003. Managing the transition from products to services. *Int. J. Serv. Ind. Manage.* 14 (2), 160–172.
- Penttinen, E., Palmer, J., 2007. Improving firm positioning through enhanced offerings and buyer–seller relationships. *Ind. Mark. Manage.* 36, 552–564.
- Peteraf, M.A., 1993. The cornerstones of competitive advantage – a resource-based view. *Strat. Manage. J.* 14 (3), 179–191.
- Porter, M.E., 1980. *Competitive Strategy*. Free Press, New York.
- Porter, M.E., 2001. Strategy and the Internet. *Harvard Bus. Rev.* 79 (2), 63–78.
- Rothenberg, S., 2007. Sustainability through servicizing. *MIT Sloan Manage. Rev.* 48 (2), 83–91.
- Sawhney, M., 2006. Going beyond the product: defining, designing and delivering customer solutions. In: Lusch, R.F., Vargo, S.L. (Eds.), *The Service-Dominant Logic of Marketing: Dialog Debate and Directions*. M.E.Sharpe, New York, pp. 365–380.
- Siggelkow, N., 2001. Change in the presence of fit: the rise, the fall, and the renaissance of Liz Claiborne. *Acad. Manage. J.* 44 (4), 838–857.
- Slywotsky, A.J., Morrison, D.J., Alderman, B., 1998. *The Profit Zone: How Strategic Business Design Will Lead You to Tomorrow's Profits?* Random House, New York.
- Stremersch, S., Wuyts, S., Frambach, R.T., 2001. The purchasing of full-service contracts: an exploratory study within the industrial maintenance market. *Ind. Mark. Manage.* 30, 1–12.
- Tam, C.M., 1999. Build-operate-transfer model for infrastructure developments in Asia: reasons for successes and failures. *Int. J. Proj. Manage.* 17, 377–382.
- Tikkanen, H., Lamberg, J.-A., Parvinen, P., Kallunki, J.-P., 2005. Managerial cognition, action and the business model of the firm. *Manage. Decis.* 43, 789–809.
- Tinnilä, M., 2007. Palvelujen liiketoimintamallit. In: Grönroos, C., et al. (Eds.), *Teollisuuden palveluksista palveluliiketoimintaan*. Teknologiateollisuus, Teknova Oy, Tampere, Finland.
- Tuli, K.R., Kohli, A.K., Bharadwaj, S.G., 2007. Rethinking customer solutions: from product bundles to relational processes. *J. Mark.* 71 (3), 1–17.
- Ulaga, W., 2003. Capturing value creation in business relationships: a customer perspective. *Ind. Mark. Manage.* 32, 677–693.
- Vandermerwe, S., Rada, J., 1988. Servitization of business: adding value by adding services. *Eur. Manage. J.* 6, 314–324.
- Vargo, S., Lusch, R., 2004. Evolving to a new dominant logic for marketing. *J. Mark.* 68 (1), 1–17.
- Walter, A., Ritter, T., Gemünden, H.G., 2001. Value creation in buyer–seller relationships: theoretical considerations and empirical results from a supplier's perspective. *Ind. Mark. Manage.* 30, 365–377.
- Wernerfelt, B., 1989. From critical resources to corporate-strategy. *J. General Manage.* 14 (3), 4–12.
- Wernerfelt, B., 1995. The resource-based view of the firm – 10 years after. *Strat. Manage. J.* 16 (3), 171–174.
- White, A., Stoughton, M., Feng, L., 1999. *Servicizing: the quiet transition to extended product responsibility*. Report by Tellus Institute.
- Wikström, K., Hellström, M., Artto, K., Kujala, J., Kujala, S., 2009. Services in project-based firms – four types of business logic. *Int. J. Proj. Manage.* 27 (2), 113–122.
- Windahl, C., Andersson, P., Berggren, C., Nehler, C., 2004. Manufacturing firms and integrated solutions: characteristics and implications. *Eur. J. Innov. Manage.* 7, 218–228.
- Wise, R., Baumgartner, P., 1999. Go downstream: the new profit imperative for manufacturers. *Harvard Bus. Rev.* 77 (5), 133–141.
- Yin, R.K., 1990. *Case Study Research – Design and Methods*, revised ed. Sage Publications, Thousand Oaks, CA.