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ANTECEDENTS TO AND PERFORMANCE EFFECTS OF SOFTWARE FIRMS' BUSINESS MODELS

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Abstract

This study examines the antecedents to and performance effects of software firms' business models. Based on a structural equation modeling of data gathered from almost 200 firms in the software industry, the study shows that firms' service orientation, technology orientation, and open innovation engagement explain a significant amount of the variation evident in their business models. In addition, the study shows that business model focus has significant implications for firm performance. Notably, software firms' service orientation is found to be positively related with their customer proximity-focused business models. The findings indicate that such business models have a significant positive impact on firms' financial performance and slightly weaker, yet significant impact on their market performance. Moreover, firms' engagement in open innovation activity is seen to foster their product uniformity-focused business models. Such business models are found to have a direct and positive effect on firms' market performance. This study makes three principal contributions. First, it formalizes the definitions of an organization's service orientation, technology orientation, and open innovation engagement. Second, it establishes a model that explains how and why these factors antecede individual firms' business models and shows their respective performance effects. Finally, the analysis of business model performance offers the basis for future research directions.

Keywords: Service orientation, Open innovation, Information technology, Business Model, Performance, Software.

1 Introduction

A business model focus manifests a firm's strategic choices. Moreover, industry level changes have been found to have strong effects on firms' business models. In many technology intensive industries, such as the software business, the topical drivers of such changes include the prolific role of services in business (Vargo and Lusch, 2004 and 2008; Dong *et al.*, 2008), the increasing value of information in competition (e.g., Ponsard 1976; Cachon and Fisher 2000) and, thus, the increasing effect of information technology on business (Barua *et al.*, 2004; Melville *et al.*, 2004). Furthermore, the emergence of open innovation activity as an alternative to proprietary innovation development (von Hippel and von Krogh, 2003; Paulson *et al.*, 2004; Bonaccorsi *et al.*, 2006) calls for novel business models in the software industry.

Previous research literature found that a viable business model is necessary for advantageous innovation, valuable service, and good performance (e.g., Engelhardt, 2004). Although the business model concept has received increasing attention in the literature (Morris *et al.*, 2005; Shafer *et al.*, 2005; Zott and Amit, 2008), little is known about how a firm's business model focus affects its performance. The complex problem of linking the business model to organizational performance is informed by the insights of multiple theoretical paradigms, including the resource-based view of the firms (Barney, 1991; Wernerfelt, 1994) and transaction cost economics (e.g., Williamson, 1985). However, the absence of a unified theoretical framework has led to a fractured research stream with many simultaneous but non-overlapping conversations.

The objectives of this paper are: (1) to investigate how three firm-level responses to the changes in the industry, operationalized as service orientation, technology orientation, and openness of innovation, affect the business models of software firms; and (2) to discuss the relationship between a business model focus and firm performance. Thus, the study examines business models from the focal firms' perspective by examining their focus on either customer proximity or product uniformity. Moreover, the effects of the business model's focus on firms' financial and market performance are analyzed.

The present study proposes a connection between the antecedents to business models – service orientation, role of information technology and engagement in open innovation – and firm performance. The model suggests that the focus of the business model adopted by software firms mediates these relationships. We thus seek to develop a conceptual model that is based not only on a single theory, but also on the theoretical discourses that are suitable for analyzing the complexity of

business models and firm performance. Ideally, it would have a robust logical formulation, while enabling the study of the rich contextual processes associated with managing software business models to achieve improved business value.

In the next section, we formalize the concepts of service orientation, technology orientation, and openness of innovation as business model antecedents. Moreover, by drawing on the literature, hypotheses are formulated on the effects of these antecedents on software firms' business models. Further, the effects of different business models on firm performance are hypothesized. Thereafter, we present our research design, measures, data analysis, and the key results. Finally, we conclude the paper by discussing the findings and implications for future research and practice.

2 Theoretical Background and Hypotheses

2.1 Firms' service orientation is a combination of service strategy and service-centric organization

The concept of organizational service orientation (Lytle, Hom, and Mokwa, 1998) has intrigued scholars and business executives alike. To investigate the effect of service orientation on a firm's business model, it is important to examine the factors that influence this at the organizational level. This study distinguishes between two different dimensions of organization level service orientation: strategy and organizational structure.

Service strategy. Prior research has examined the strategy dimension of service orientation by assessing the extent of an organization's service orientation in its business strategy (Berthon *et al.*, 1999; Mathieu, 2001; Antioco *et al.*, 2008) and marketing strategy (Homburg *et al.*, 2002). The research on service marketing strategy draws upon the firm's market orientation (Jaworski and Kohli, 1993) and customer orientation (Narver and Slater, 1990; Gouthier and Schmid, 2003). Notably, the literature has reached a consensus in which a service-centric strategy provides a more holistic and long-term approach to customers than does a product-oriented strategy. Furthermore, Mathieu (2001) conceptualizes a service provider's strategy in terms of providing services supporting the products (SSP) and services supporting the client's actions (SSC). Vargo and Lusch (2004) and Dong *et al.* (2008) underscore that such a strategy manifests either a goods- or service-centered logic in business. Gummesson (2008) and Maglio and Spohrer (2008) argue that a fundamental principle of service-dominant strategy is that value is the outcome of co-creation between service providers and their clients. However, some authors (e.g., Grönroos and Ravald, 2009) emphasize that service strategists should view the customer as the value creator and a service provider as

a value facilitator. They claim that value created by the customer is exchanged for value created by the firm, with service providing a mediating factor in the process. Similarly, Blazevic and Lievens (2008) and Cova and Salle (2008) suggest that service providers' customer orientation and value co-creation describe firms' approach to service development as part of their service strategy.

Service-centric organization. Service orientation has been examined in terms of an organization's structure, climate, and culture (e.g., Lytle *et al.*, 1998; Schneider *et al.*, 1992). Sinkula *et al.* (1997) show that customer service processes influence organizational attributes such as organizational structure and design. In addition, Bowen *et al.* (1989) submit that the management of effective service organizations relies on climatic and cultural mechanisms such as shared service norms and values. In the customer service processes of service-oriented organizations, learning processes are shown to be decisive drivers of performance (Sinkula *et al.*, 1997). Goldstein *et al.* (2002) add that service components represent "a combination of processes, people skills, and materials that must be appropriately integrated to result in planned or designed service." Antioco *et al.* (2008) point out that the resources needed to support service delivery, and the resulting complexity of the overall service offerings, create functional interdependencies that require effective management.

Thus, the literature gives rise to an understanding that firms' service orientation augments customer proximity and facilitates product uniformity-focused business models. From these notions it follows that:

H1a: *Software firms' service orientation is positively related to their customer proximity-focused business models.*

H1b: *Software firms' service orientation is positively related to their product uniformity-focused business models.*

2.2 Technology orientation is about focusing exogenous and endogenous technological change

The expanding use of information technology stimulates innovation in business practices and organization models. The organizational learning literature (e.g., March, 1991; Auh and Menguc, 2005) suggests that technology orientation can take two distinctive forms: technology exploration and exploitation. That is, firms either emphasize exploration in seeking effectiveness in new business development or exploitation in seeking efficiency of operation (Gupta *et al.*, 2006). However, prior research on strategic information systems has shown that a narrow focus on technology as a source of competitive advantage is misguided and misleading (Piccoli and Ives, 2005). Hence, this study focuses on technology

orientation through its two dimensions: the endogenous context and exogenous environment.

Endogenous context. Technology orientation within an organization is about refinement, choice, production, efficiency, selection, implementation, and execution in information systems resource development. It is focused on the use and refinement of existing knowledge and technologies in order to strengthen the excellence of the present operation (Levinthal and March, 1993). Products and services that result from improved processes are likely to satisfy their customers and lead to increased revenues, and ultimately to improved firm performance (Benner and Tushman, 2003). However, Matthysens *et al.* (2009) argue that firms with an exploitation mindset are bound to existing relations, structures, and behavior that hinder the introduction of new concepts. Incremental technological innovations and those designed to meet the needs of existing customers are exploitative and build upon existing organizational knowledge. Moreover, Von Hippel (1988) suggests that process innovators often need to work closely with external partners to develop new technologies. Davidson and Davis (1990) argue that information technology is driving a shift in business models from mass production to mass customization.

Exogenous environment. Turnbull *et al.* (1996) discuss technologies as resources that are developed in interaction with the external environment, e.g., with innovation partners. They distinguish product technologies, which consist of the ability to design products and services, from process technologies, which comprise the ability to manufacture or produce these products and services. Relationships with the environment and explorative technology orientation are crucial under the conditions of technological uncertainty (Paladino, 2008). Technology exploration refers to firms' ability to capture resources through activities characterized by search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation (March, 1991). These arguments support the hypothesis that explorative technology orientation is associated with business models that focus on customer proximity. In addition, Katila and Ahuja (2002) suggest that exploration plays a key role in creating new knowledge, which results in completely new products. In this vein, explorative technology orientation can be present in business models that focus on product and service innovation. Hence, it is rational to suggest that:

H2a: *Software firms' technology orientation is positively related to their customer proximity-focused business models.*

H2b: *Software firms' technology orientation is positively related to their product uniformity-focused business models.*

2.3 Openness of innovation stands for organizational and product-related openness

The widespread popularity of the Internet has led to a drastic increase in the number of open source activities and new open source software (OSS) projects (Lerner and Tirole, 2002). Pittaway *et al.* (2004) maintain that more than ever, innovation development refers to the creation and management of strategic relationships and alliances with other organizations. Inter-organizational collaboration is a hallmark of contemporary innovation activity (Hinterhuber 2002). It is often claimed to be the source of distinct competitive advantage to both small and large companies (Borch and Arthur, 1995; Gulati *et al.*, 2000), as innovation networks and communities allow firms to exploit external resources and develop their own capabilities (Hung, 2002). Likewise, Reichstein and Salter (2006) argue that innovators often rely on many different external sources of knowledge. However, engagement in open innovation poses a challenge for firms participating in such collaboration: learning from partners in order to maximize the effectiveness and efficiency requires transparency in the partnership, but excess leakage of information in the partnership may dilute the firms' internal sources of competitive advantage (Mohr and Sengupta, 2002). In the present study, the aspects of openness in innovation activity are investigated through organizational openness and open source products and components.

Organizational openness. Having an open organization increases the cross-fertilization and cross-functional support of ideas (Aiken and Hage 1971). In such an organization, there is a willingness to collaborate across organizational units and acquire knowledge outside the organization. Furthermore, it is noted that increased openness reduces fear and therefore encourages new ideas and risk taking (Scott and Bruce, 1994). Open source innovation offers an interesting means of organizing software development. OSS projects are exemplars of a "soft" mode of governance (Schultze and Orlikowski, 2001), as open source innovation is based on online communication; i.e., the Internet, which has been described by Vujovic and Ulhøi (2008) as an e-R&D networking tool for openness and teamwork and for decentralized linkages and knowledge flows. Since OSS projects are based on online communication, cooperation, and coordination, they can be characterized as virtual organizations or communities. This kind of innovation activity, which is focused on creating publicly available software, relies largely on a community of voluntary contributors (i.e., software developers and users). Vujovic and Ulhøi (2008) emphasize that the transfer and sharing of knowledge in such a community involves various kinds of social interaction. Vujovic and Ulhøi (2008) argue that tighter intra- and inter-organizational linkages increase efficiency by streamlining the handoffs between activities, thus accelerating delivery times.

Open source products and components. The soft mode of governance introduced by (Schultze and Orlikowski, 2001) is made possible by two interrelated and mutually reinforcing features of software production—modularization and distribution—in which coordination is supported by an extensive exchange of information during product development (Bonaccorsi and Rossi, 2003). Modularity as a general structuring principle is recognized from organization theory that dates to the early literature on technology design (Simon, 1962; Alexander, 1964). Vujovic and Ulhøi (2008) argue that when applied to software, it allows a rather loosely managed and structured approach to production. In such a setting, software developers can work on different modules independently and exchange experiences together. Moreover, they can benefit from the innovation capacity of a larger group of developers in problem solving. Sanchez and Mahoney (1996) argue that such modularized production leads to modular organizations. Shared files and lists make contributions to software development visible, and thus reveal the organization of contributions to some extent. Shared information, such as component libraries, user support, technical discussions, and announcements, are assumed to make knowledge dissemination easier and facilitate learning from the project (Kessler, 2003). In this way, the Internet provides planning and organizational resources as well as cost-effective communication and distribution systems that are used in both product development and customer-specific system implementations. The following hypotheses are suggested:

H3a: *Openness of innovation has a positive relationship with software firms' customer proximity-focused business models.*

H3b: *Openness of innovation has a positive relationship with software firms' product uniformity-focused business models.*

2.4 Business model focus affects firm performance

According to Cox and Mason (2007), a crucial question in business model focus is the question of standardization versus adaptation. Regarding the nature and purpose of offerings provided by software firms, and following Mathieu (2001), who distinguishes services supporting the product (SSP) from services supporting the client's actions (SSC), we note the distinction between offerings provided in support of the product uniformity-focused business models and those in support of the client's actions in the customer proximity-focused business models. Thus, the first aspect in measuring an offering is its homogeneity or similarity across several transactions. This is a central issue in transaction cost economics (TCE) (Williamson, 1985), which argues that economies of scale are realized by increasing the number of similar offerings. Alternatively, the potential economies

of scope are related to close integration (i.e., conducting more business between the seller and buyer).¹

2.4.1 Business models focusing on customer proximity

Some business models aim to create new types of transactions with customers; i.e., by increasing the total number of transaction types. If this is pursued by focusing on a small number of customers, it also strengthens the focal firm's bargaining power in its customer relationships vis-à-vis other business model stakeholders (Zott and Amit, 2008). The current consensus in the industrial marketing literature suggests that firms benefit from building long-term relationships with their customers instead of focusing separately on each transaction (Sheth and Parvatiyar, 1995). Hence, it can be argued that economies of scope exist when for all outputs X and Y, the cost of joint production $C(X,Y)$ is less than the cost of producing each output separately $C(X) + C(Y)$. This applies to all types of offerings and transactions, even in enterprises and organizational entities processing knowledge related to software. In terms of transaction cost economics (TCE), the economies of scope accrue if cost savings result when different offerings are joined into a single buyer-seller transaction (Williamson 1985, 112):

$$(1) \quad C(X,Y) < C(X) + C(Y).$$

In the case of software related services, this model represents a situation outlined by Lovelock (1991), in which the nature and recipient of services, the relationship between the firm and customers, and the level of service customization (Reich and Huff, 1991), represent an intense relationship between the seller and the buyer, a high degree of customization, and an emphasis on people as providers and recipients (Mathieu 2001). From the literature focused on market orientation (Narver and Slater, 1990; Jaworski and Kohli, 1993; Deshpandé *et al.*, 1993), we have learned that customer orientation is linked to business performance, but in a complex way that requires myriad capabilities. Although empirical research has been inconsistent in its support of the claim that customer orientation strengthens business performance, the study by Zhu and Nakata (2007) strengthens the notion that customer orientation contributes to performance. In view of this, it is hypothesized that:

H4a: *Software firms' customer proximity-focused business models have a direct and positive relationship with their market performance.*

¹ Scale economies accrue when cost savings are realized by homogenous objects in multiple transactional relationships. Economies of scope accrue if cost savings result when heterogeneous objects are joined in a single buyer-seller transaction (Williamson 1985, 112).

H4b: *Software firm's customer proximity-focused business models have a direct and positive relationship with their financial performance.*

2.4.2 Business models focusing on product uniformity

In the business model type characterized by standardized product/service offerings, innovation focus can be laid on developing uniform products, uniform service processes (Apte and Vepsalainen, 1993), or both. A great deal of business literature emphasizes the scale advantages of firms (e.g., Barnard and Ehrenberg, 1990). These studies describe the multiple advantages enjoyed by large-scale offerings; i.e., offerings that are provided to a larger target group instead of single or small groups of clients within narrow customer domains. However, scale economies are not only founded on adding new customers, but also having more loyal customers in terms of repeat purchases. Zott and Amit (2008) show that efficiency-centered business models aim to reduce transaction costs for all transaction participants. According to Williamson (1985, 112), scale economies accrue when cost savings are realized by providing similar offerings in multiple transactions:

$$(2) \quad C(X1+X2) < C(X1) + C(X2).$$

Uniform software product/service offerings range from dedicated domain-specific software to a standardized online service. Lucas *et al.* (1988) define a dedicated software package as one that offers a solution to the user's information processing problem; the package is dedicated to some particular function like transaction processing or production planning. Empirical research has indicated that a firm's propensity to enter exploration and exploitation alliances and networks is related to the resource endowments of the firm (Park *et al.*, 2002). The importance of possession of or access to key resources in the network becomes obvious when firms aim to develop new products and business concepts. Radically new innovations or those for emergent customers or markets are exploratory, since they require new knowledge or departures from existing skills (March, 1991; Levinthal and March, 1993). Hence, the following hypotheses are suggested:

H5a: *Software firm's product uniformity-focused business models are positively related to their market performance.*

H5b: *Software firm's product uniformity-focused business models are positively related to their financial performance.*

Firm performance has been studied along with a wide variety of managerial issues, such as strategy types (Miles and Snow, 1978), customer orientation (Narver and Slater, 1990; Jaworski and Kohli, 1993), and innovation orientation (e.g. Siquaw *et al.*, 2006). Demsetz (1973) suggests that firms with higher market share gain efficiencies that translate into greater profitability. This logic forms the premise

for positing that market performance precedes and influences financial performance. Furthermore, empirical studies have cited market performance as a likely antecedent of financial performance. In a meta-analysis of determinants on firm performance, Capon *et al.* (1990) found that market share, sales growth, and quality of products and services are positively tied to financial performance. In another study, Szymanski *et al.* (1993) learned that market share is a significant contributor to profitability. Based on these conceptual and empirical studies, it is reasonable to suggest that:

H6: *Firms' market performance is positively related to financial performance.*

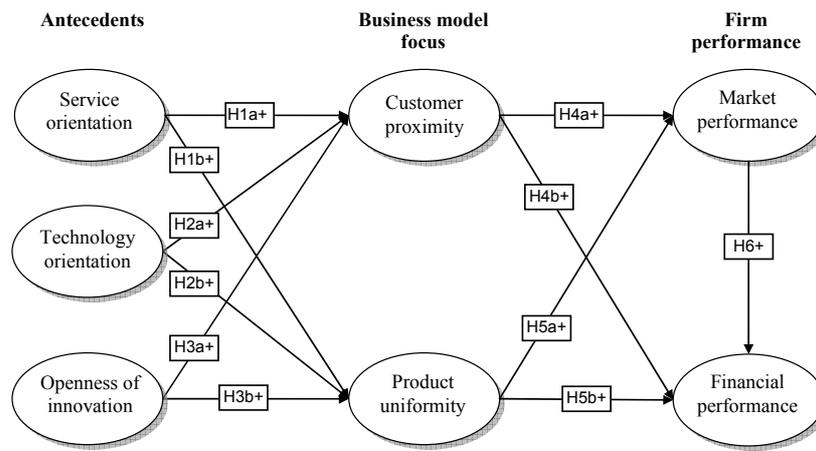


Figure 1. The conceptual model of the study and established hypotheses.

3 Methodology and data

For the purposes of the study, an online survey of software firms' strategies, business models, and innovation approaches was conducted in 2008-2009. The empirical inquiry was administered to virtually all software firms in Finland. The procedure to acquire the contact information for all firms in the sampling frame was threefold. First, the names and contact information of firms that belong either to the Association of the Finnish Software Entrepreneurs or the Finnish Software Business Cluster were obtained from these societies. Second, the names and e-mail addresses of the senior managers of these firms were collected from the companies' Web pages in May-August 2008. Third, the preliminary set of firms was completed using the standard industrial classification of Statistics Finland, selecting all firms in the category of software consultancy and supply (TOL 2002-722) in January 2009. The final set included all identifiable firms in the sampling frame, and the missing contact information was completed by consulting the nationwide electronic telephone catalog. The total sample consisted of potential respondents in 1355 firms. The average number of selected potential respondents

in all firms was two. The respondents were recruited via e-mail where an invitation and a link to the survey were included in the message body. The questionnaire yielded 197 usable responses from 179 firms. Thus, the yielded scope of the survey equates to 13.2 %, which is considered acceptable in online surveys targeted to nationwide whole sampling frames covering all firms in the selected industry.

Following the standard industrial classification (SIC; Dun and Bradstreet), firms in the sample were classified according to the number of employees into micro firms (fewer than 5 employees); small firms (5-19 employees); small to medium-sized firms (20-99 employees); medium-large firms (100-499 employees); and large firms (500 or more employees). Using this classification, the distribution of firms in the sample is shown in Table 1.

Table 1. Distribution of firms in the sample by size (n=197)

Category	Frequency	Percent	Valid %	Cumulative %
Fewer than 5 employees	45	22.8	23.0	23.0
5-19 employees	67	34.0	34.2	57.1
20-99 employees	48	24.4	24.5	81.6
100-499 employees	17	8.6	8.7	90.3
500 or more employees	19	9.6	9.7	100.0
Total	196	99.5	100.0	
Missing	1	.5		
Total	197	100.0		

The majority of firms in the sample are considered small to medium sized in terms of the number of employees. In addition, 25% of the firms had an annual turnover of less than 0.5 million euros (MEUR), 50% of the firms had annual turnover with less than 1.8 MEUR, and 75% with less than 8 MEUR. The turnover of the largest firm was equal to 4,500 MEUR. The distribution of turnover in the sample is consistent with previous research on the Finnish software industry (e.g., the yearly Finnish software business survey 2002-2008).

3.1 Variables

Multi-item scales were used to measure all constructs. The survey addressed service orientation, technology orientation, engagement in open innovation, business model focus, and firm performance. All items were measured on a five-point Likert-type scale (1="strongly disagree" to 5="strongly agree"). The scales for service orientation and business model focus were developed for this study on the basis of a literature review and interviews with the industry experts and senior

managers in software firms. Conversely, the items for technology orientation, openness of innovation activity, and firm performance were drawn from the literature; however, the wording of the questionnaire was modified slightly in order to fit the context of software firms (see Appendix 1 for the survey scales).

Dependent variable. The dependent variable is firm performance. In the analysis, this is investigated in terms of market performance and financial performance. Market performance (MPERF) is a reflective construct that consists of three items drawn from prior literature (Deshpandé *et al.*, 1993; Jaworski & Kohli, 1993; Kandemir *et al.*, 2006). The items measure firms' market performance (during the recent three years) in terms of market share (y_7), changes the firm has induced in the market (y_8), and growth relative to competitors (y_9). Financial performance (FPERF) is a formative construct which consists, *ex officio*, of two items that are used commonly in the extant research literature to investigate firms' economic success (during the last three years): improved profitability (y_{10}) and increased product/service sales (y_{11}). Because objective measures of individual firms' performance relative to their competitors are not available, we rely on the respondents to provide the perceptual measure. However, even though information regarding the dependent and independent variables comes from the same respondents and a common method bias exists, we do not believe that the bias would have a remarkable influence on the analysis. The issue of potential bias is discussed later in the section on empirical analysis.

Independent variables. The independent variables include three second-order constructs that capture firms' service orientation (SERVOR), technology orientation (TECHOR), and openness of innovation activity (OPENNESS). SERVOR is a second-order construct that uses two reflective indicants. One of them is a first-order construct that captures a firm's service strategy (SERVSTRAT). Its four reflective indicators (adapted from Homburg *et al.*, 2002) encompass the importance of services in a firm's marketing strategy (x_1), the extent to which a firm's solutions are sold as services (x_2), the importance of services as a source of competitive advantage (x_3), and the salience of services in the way the firm responds to its customers' needs (x_4). The other first-order construct in service orientation is service structure (SERVSTRUC). Its three reflective indicators, newly established for this study, address the perceptions on how well the organization's structure supports the realization of services (x_5), how service-centered the organization culture is (x_6), and how well the company's information systems support the service activity (x_7).

Gatignon and Xuereb (1997) and Zhou *et al.* (2005) have studied the extent and forms of technology orientation in terms of the development and use of sophisticated technologies. In this study, TECHOR is aggregated from two first-order constructs which describe technological issues that are endogenous and

exogenous to the firm. Consistent with Gatignon and Xuereb (1997) and Zhou *et al.* (2005), the items that capture endogenous technology orientation (ENDOTECH) include those that measure the readiness to develop new technologies (x_8), technological knowledge (x_9), as well as the preparedness to offer advanced technologies compared to competitors (x_{10}). In addition, the extent to which the company culture encourages the development of technological innovations (x_{11}) is measured. Moreover, following Jaworski and Kohli (1993) and Desarbo *et al.* (2005), we encompass exogenous technology orientation (EXOTECH) through the following reflective indicators: technological changes provide remarkable opportunities to actors in the industry (x_{12}), many novel product ideas in the field have arisen from technological breakthroughs (x_{13}), and the extent to which the products and/or services in the business comprise state-of-the-art technology (x_{14}).

Bonaccorsi and Rossi (2003) and Dahlander and Magnusson (2008) have studied the forms and effects of firms' engagement in open innovation in the field of open source software. Consistent with He and Wong (2004), who distinguish the objectives and structures designed for efficiency of operation from those designed for the exploration of innovation, our model of firms' engagement in open innovation (OPENNESS) distinguishes organizational openness from that of software development. Organizational openness in innovation activity (OORG) is conveyed by asking respondents about the extent to which the company culture encourages the search for new ideas outside the organization (x_{15}), organization-wide elaboration and testing of ideas (x_{16}), the willingness of personnel to innovate with people outside their own unit (x_{17}), and experience-based perception of openness as a factor to accelerate development (x_{18}). Moreover, the openness of the software product (OPROD) is investigated by asking respondents about the extent to which collaboration and information sharing are present in the development of their companies' products and/or services (x_{19}), the use of open source software (OSS) components as part of the firm's products (x_{20}), and the salience of OSS development in the company's business.

Intermediary variables. The intermediary variables encompass business model type. To this end, we identify the customer proximity and product uniformity-focus in business models, and analyze their effects on firm performance. Narver and Slater (1990), Jaworski and Kohli (1993), and Deshpandé *et al.* (1993) developed scales which, in whole or part, are the most prominent assessments of customer orientation. Following their scales and that of Theoharakis and Hooley (2008), the three reflective indicators of customer proximity-focused (CUSTFOCUS) business models embody customer participation in the solution development work (y_1), the density of collaboration with clients in the development work (y_2), and the extent to which the company has focused on enhancing current customer relationships (y_3). Similarly, consistent with Tether

and Tajar (2008) the three reflective indicators for the product uniformity focus (STDFOCUS) in business models include the extent to which the company focuses on the development of new products and services (y_4), building success based on the development capabilities for new products and/or services (y_5), and the ambition to develop products and services that are new to the industry (y_6). In this vein, the intermediary variables include aspects related to both exploration and exploitation, as innovations are often classified by whether they address the needs of existing customers or are designed for new or emergent markets (Benner and Tushman, 2003).

3.2 Scale validity and reliability

The present study uses Wold's (1982) method of partial least squares (PLS) to estimate parameters. To assess the reliability and validity of the constructs, composite reliability values (ρ_c) and average variance extracted values (ρ_v) were examined for each first-order latent variable. Construct reliability was assessed using the composite reliability analysis suggested by Fornell and Larcker (1981). It can be written using the calculation formula:

$$(3) \quad \rho_c = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum \text{var}(\varepsilon_i)}$$

where λ_i is an individual factor loading and $\text{var}(\varepsilon_i)$ is its error variance. All composite reliability values were above the recommended level of .70 (Fornell and Larcker, 1981). A complementary measure to composite reliability is the average variance extracted, which is useful in examining convergent validity. Average variance extracted is the average variance shared between a construct and its measures (Hulland, 1999), and the equation is defined as:

$$(4) \quad \rho_v = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum \text{var}(\varepsilon_i)}$$

where the ρ_v is computed as the total of all squared standardized factor loadings. It shows directly the amount of variance captured by the construct in relation to the variance due to measurement error. In our study, all constructs exceeded the recommended .50 benchmark (Diamantopoulos and Siguaw, 2000).

Overall, the composite reliability values and average variance extracted values indicate that the scales perform adequately. In addition to these two measures, the means, standard deviations, Cronbach's alphas for internal consistency, and correlations for the constructs are presented in Appendix I. The customer proximity-focused business model construct (CUSTFOCUS) had the lowest coefficient value ($\alpha=.65$) in the data set. Yet a Cronbach's alpha that is equal to or

greater than .60 is considered acceptable, as both the composite reliability value (.80) and average variance extracted value (.57) indicate that the construct performs well—although we would generally prefer a stronger standard of $\alpha > .70$. It should be noted, however, that the reliability measure available in Cronbach's alpha is non-robust and is extremely sensitive to violations, as a single observation can have a significant impact on this coefficient (Christmann and van Aelst, 2006). Hence, we consider it in proportion to other reliability measures.

Discriminant validity; i.e., the extent to which different constructs diverge from each other, was assessed by examining the correlation matrix of the constructs. According to Fornell and Larcker (1981), satisfactory discriminant validity among constructs is obtained when the square root of the average variance extracted is greater than corresponding construct correlations. This implies that the variance shared between any two constructs is less than that shared between a construct and its indicators. For each pair of constructs, the square root of the average variance extracted exceeded their correlations. Thus, all constructs meet the criterion, which supports their discriminant validity.

In addition, to address common method variance (CMV) which can be problematic when both dependent and independent variables are measured in the same survey, the Harman's one-factor test was used. The factor analysis revealed that there were five factors with an eigenvalue greater than 1, and no single factor dominates the explanation of the total variance. The first factor explains 19% and together, the five factors explain 65% of the total variance. Thus, according to the criterion presented by Podsakoff and Organ (1986), CMV is unlikely to be a concern in the present study.

Furthermore, the Variance Inflation Factor (VIF) values were computed for the endogenous regressors of the formative construct (FPERF) as suggested by Myers (1986) and Mason and Perreault (1991). These values provide an indication of the linear associations among regressors that might lead to multicollinearity problems. If any VIF value exceeds 10, Myers (1986) suggests that there may be cause for concern. The calculated VIF value for the regressors (VIF=1.213) is below 10, which does not suggest a problem with multicollinearity in the model.

3.3 Second-order constructs

PLS enables scholars to investigate models at a higher level of abstraction (Lohmöller, 1989), which is useful in estimating complex models (Chin, 1998). For this purpose, Wold (1982) suggests the repeated indicators (i.e., the hierarchical component model) method for measuring second-order constructs, which is useful in estimating complex models (Chin, 1998). That is, all indicators of the first-order constructs are reassigned to the second-order construct. Consequently, the

manifest variables are used twice: for the first-order latent variable (“primary” loadings) and for the second-order latent variable (“secondary” loadings) as suggested by Wetzels *et al.* (2009). Following Jarvis *et al.* (2003), such a model is a total disaggregation, second-order factor model. It has a series of first-order latent factors with reflective indicators. These first-order factors are themselves reflective indicators of an underlying second-order construct.

According to Hulland (1999), researchers need to think about whether it is more correct to consider the underlying construct as causing the observed measures (i.e., a reflective relationship) or of the measures as causing or defining the construct (i.e., a formative relationship). A prerequisite for the repeated indicators approach is that all indicators of the independent first-order and the second-order factors should be configured as reflective. Thus, in contrast to the formative dependent construct (FPERF), all items included in our model as independent variables were configured as reflective indicators (Fornell and Larcker, 1981; Haenlein and Kaplan, 2004). Moreover, according to Diamantopoulos *et al.* (2008) the second-order latent variable should be used as exogenous variable, because its variance is explained by its indicators and, otherwise, the specification of an additional source of variation (i.e., an antecedent construct) would be conceptually questionable. In our model, the second-order constructs of SERVOR, TECHOR, and OPENNESS are considered exogenous variables as suggested by Diamantopoulos *et al.* (2008).

4 Empirical analysis and results

The data in the present study were analyzed and hypotheses examined through partial least squares (PLS) structural equation modeling using the SmartPLS 2.0 developed by Ringle *et al.* (2005). PLS path modeling is a component-based SEM approach that does not require multivariate normal data and places minimum requirements on measurement levels (Hulland 1999; Tenenhaus *et al.*, 2005). Moreover, the use of the PLS method is typically recommended in situations in which there are no stable, well-defined theories to be tested in a confirmatory research setting, the research model includes reflective and formative constructs, or the sample size is small (Haenlein and Kaplan, 2004). In addition, Barclay *et al.* (1995) suggest that PLS is viable for analyzing predictive research models that are in the early stages of theory development, as is the model in the present study. Because PLS considers all path coefficients simultaneously and estimates multiple individual item loadings in the context of a theoretically specified model rather than in isolation, it helps to avoid biased and inconsistent parameter estimates for equations.

Baumgartner and Homburg (1996) suggest a three-step procedure for a rigorous analysis of data in structural equation modeling. First, in line with (Kaplan, 1990), they emphasize the importance of ensuring that there are no coding errors, that variables have been recoded correctly if necessary, and that missing values have been accounted for properly. Second, they suggest that it is helpful to investigate possible distorting influences introduced by the presence of a few influential outliers. Finally, they posit that it is crucial to examine the approximate normality of the data and to take corrective action if this assumption is violated, since most estimation methods assume that the data come from a multivariate normal population. Following these guidelines, the data were coded and cross-checked for both the type of the variable and content of the cases. Missing values were marked and treated in the analysis by the SmartPLS algorithm. An exploratory factor analysis was then conducted in SPSS 16.0 with principal component analysis and Varimax rotation. The factor analysis provided support for the hypothesized constructs as they emerged as clear factors from the data. Only variables with absolute coefficient values exceeding .50 within the constructs were accepted for the structural equation analysis.

The hypotheses were examined with full-sample using t-tests (df=517). First, estimates of the standardized regression coefficients for the paths in a structural equation model were generated. Then, the bootstrap procedure was used to approximate the sampling distribution of an estimator by resampling with replacement from the original sample, which is necessary to derive valid t-values. Following Davidson and MacKinnon (2000), the analysis was conveyed using 1,000 bootstrap replications. The structural equation model and the results of the analysis are shown in Figure 2.

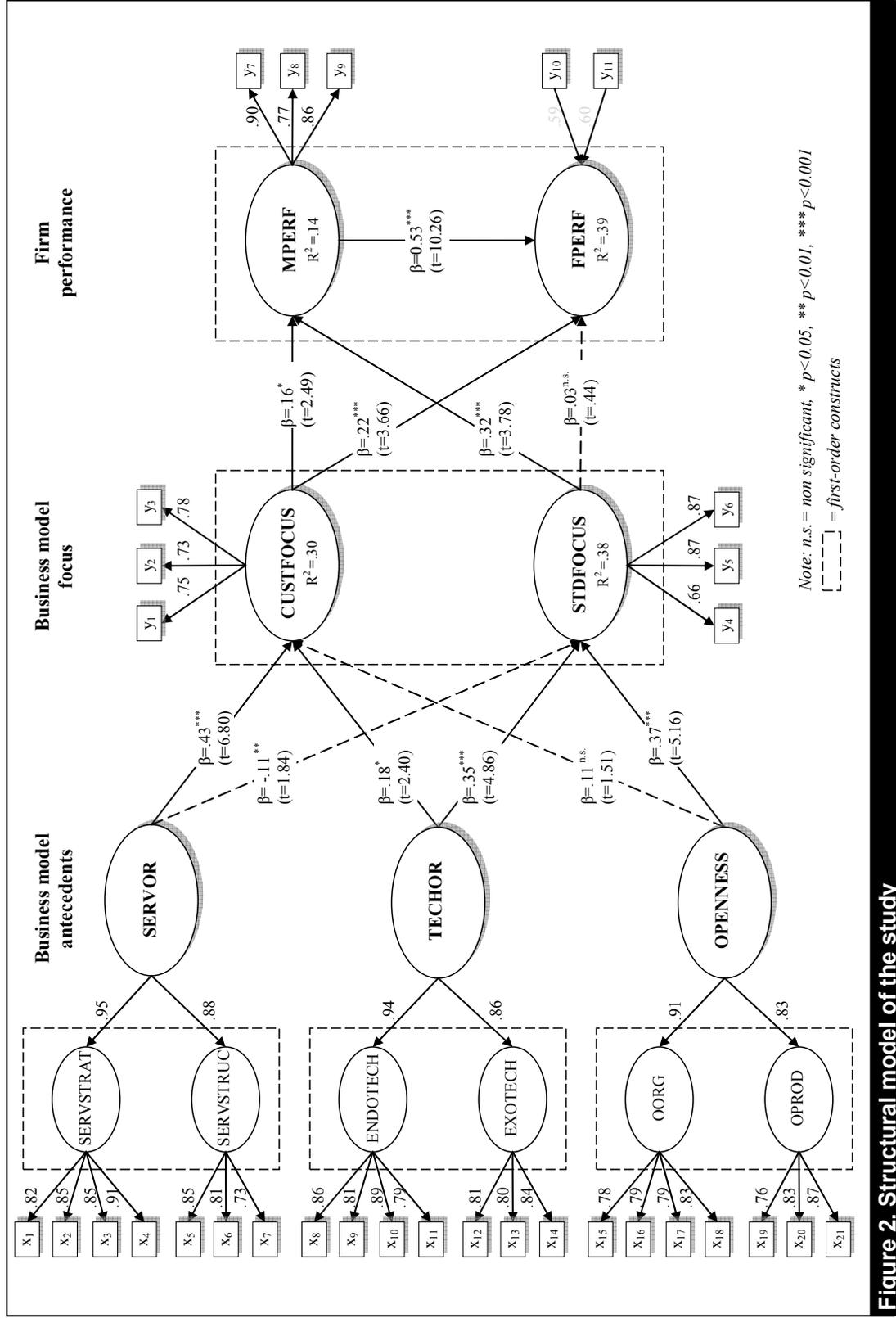


Figure 2. Structural model of the study

Table 2 lists the results for the hypotheses. As predicted in hypotheses H1a, a software firm's service orientation (SERVOR) has a positive relationship with the customer proximity-focus of the business model (CUSTFOCUS) ($\beta=.43$, $t=6.80$, $p<.001$). However, contrary to our hypothesis H1b, its service orientation does not have a statistically significant effect on the product uniformity focus (STDFOCUS) of business model ($\beta= -.11$, $t=1.84$, $p<.001$). Conversely, the results of the analysis suggest that a software firm's technology orientation (TECHOR) advances both its customer focusing business models ($\beta=.18$, $t=2.40$, $p<.05$) and standard offering-focused business models, ($\beta=.35$, $t=4.86$, $p<.001$). Hence, the analysis provides support to hypotheses H2a and H2b. Against our hypothesis, a firm's engagement in open innovation activity (OPENNESS) does not have a significant effect on customer-focused business models ($\beta=.11$, $t=1.51$, $p<.132$). Hypothesis H3a is thus not supported. However, engagement in open innovation has a significant positive effect on standard offering-focused business models ($\beta=.37$, $t=5.16$, $p<.001$).

Table 2. Results of hypotheses testing (n=197, bootstrap samples=1000, df=517)

H#	Relationship	β	t-value	p-value	Support
H1a	SERVOR \rightarrow CUSTFOCUS	.43	6.80	<.001	Yes
H1b	SERVOR \rightarrow STDFOCUS	-.11	1.84	.066	No
H2a	TECHOR \rightarrow CUSTFOCUS	.18	2.40	.017	Yes
H2b	TECHOR \rightarrow STDFOCUS	.35	4.86	<.001	Yes
H3a	OPENNESS \rightarrow CUSTFOCUS	.11	1.51	.132	No
H3b	OPENNESS \rightarrow STDFOCUS	.37	5.16	<.001	Yes
H4a	CUSTFOCUS \rightarrow MPERF	.16	2.49	.013	Yes
H4b	CUSTFOCUS \rightarrow FPERF	.22	3.66	<.001	Yes
H5a	STDFOCUS \rightarrow MPERF	.32	3.78	<.001	Yes
H5b	STDFOCUS \rightarrow FPERF	.03	.44	.660	No
H6	MPERF \rightarrow FPERF	.53	10.26	<.001	Yes

Furthermore, firms' business model types have significant effects on firm performance. Supporting our hypotheses, CUSTFOCUS advances both a firm's market performance (MPERF) (H4a) ($\beta=.16$, $t=2.49$, $p<.05$) and financial performance (FPERF) (H4b) ($\beta=.22$, $t=3.66$, $p<.001$). Moreover, a firm's focus on product uniformity (STDFOCUS) has a significant positive effect on its market performance (MPERF) ($\beta=.32$, $t=3.78$, $p<.001$), thus supporting hypothesis (H5a). Yet the analysis shows no significant relationship between a firm's focus on standardized offerings and its financial performance (FPERF) ($\beta=.03$, $t=.44$, $p=.660$), which contradicts our hypothesis H5b. Finally, the analysis reveals that

market performance has a significant positive effect on financial performance ($\beta=.53$, $t=10.26$, $p<.001$). Table 2 summarizes the results. Nevertheless, there is a statistically significant difference between individual customer proximity-focused business models (CUSTFOCUS) and product uniformity-focused business models (STDFOCUS). Customer focus has a direct positive effect on a firm's financial performance (FPERF) ($\beta=.22$, $t=3.66$, $p<.001$), while it has a slightly weaker, yet positive effect on firms' market performance (MPERF) ($\beta=.16$, $t=2.49$, $p<.05$). Conversely, standard offering focused business models have a statistically significant effect only on a firm's market performance (MPERF) and not on its financial performance (FPERF).

The explanatory power of the model for the dependent construct was measured by using the squared multiple correlations value (R^2) suggested by Hulland (1999). In the present study, the independent constructs were able to explain 14% of the variance in market performance (MPERF) and 36% of the variance in financial performance (FPERF), which is considered good for this kind of analysis. PLS path modeling includes no proper, single goodness of fit measure (GoF). However, to conclude our structural analysis, we calculate the goodness of fit (GoF) of the model using the global fit measure for PLS by Tenenhaus *et al.* (2005). By taking the square root of the product of the variance extracted of all constructs with multiple indicators and the average R^2 value of the endogenous constructs, we can calculate a fit measure ranging between 0 and 1. The measure was calculated using the second-order constructs and the dependent construct. According to the categorization by Cohen (1988) and using .50 as a cutoff value for communality (Fornell and Larcker, 1981), the GoF criteria for small, medium, and large effect sizes are .10, .25, and .36. In the present model, the GoF is .43, which indicates a good fit of the model to the data.

5 Discussion and Conclusion

This study investigates the determinants of business model performance by integrating firms' service orientation, technology orientation, and openness of innovation into a structural equation model. The analysis provides evidence of the connection between these business model antecedents and their effects on software firms' business model focus. In other words, firm-level orientations regarding the service dominance, technological dynamics, and open innovation in the software industry have significant effects on software firms' business models and, ultimately, on the firms' performance. In particular, the findings indicate that service orientation, technology orientation, and engagement in open innovation have remarkable influences on firms' business model focus.

The results support the conclusion that technology plays a significant role in the contemporary software business. First, Congruent with Vujovic and Ulhøi (2008), it can be concluded that open innovation fosters the development of software offerings. Second, information technology plays a key role in supporting customer service-focused business models. Moreover, the results show that the business model focus affects firm performance. High customer proximity seems to have a direct positive effect on firms' financial performance, whereas it seems to have a slightly weaker, yet positive effect on firms' market performance. These findings represent something of a contrast to the findings of Zhu and Nakata (2007), who found that customer orientation is related to market performance, and that market performance is associated with financial performance. Our findings give rise to critical concerns against their chain effect in line with the notions of Macdonald (1995), who suggested: "The firm which would take getting close to the customer seriously must consider the degree to which it can, should, and will integrate with its customers' activities, and probably with those of others in the market." Conversely, high product uniformity; i.e., focus on standardized offerings, seems to have a statistically significant effect only on firms' market performance and not on their financial performance. However, market performance has a strong positive relationship with financial performance, which suggests that the findings are obtained through a cross-sectional survey, where the performance effects were encompassed over a three-year period. That is, the results should be valid, at least in the short-term.

The study makes an important contribution to the literature on business models. First, it establishes the constructs of service orientation, technology orientation, and openness of innovation activity as business model antecedents that explain a significant deal of the variation in software firms' business models. Second, it investigates the contingent role of business models in the determination of firm performance. In doing so, the study extends the scholarly inquiry into business model focus as a contingency factor that impacts firm performance. Whereas the traditional focus in the literature on firm performance has been on the firm's strategy or administrative structure, the analysis of the present study is centered on the types of business models expressed in terms of customer proximity and product uniformity. Hence, the study contributes to the literature on business models and offers the basis for future research directions.

This work also has some valuable practical implications. One obvious piece of advice is the need for business managers to become more conscious of their business model focus and its impact on firm performance. Ultimately, the focus on supporting customer actions through customer proximity seems to be associated with both good financial performance and good market performance. At the same time, its relationship with market performance is slightly weaker than the relationship with financial performance. Conversely, the focus on product

uniformity, or standardization for productivity, seems to be associated with good market performance in terms of increased market share, growth, and the firm's ability to induce changes in the market. Yet it does not seem to augment short-term financial performance. However, according to prior studies, the focus on product innovations may have more long-term effects, which were not revealed in this study.

Regarding the limitations of the present study, the empirical analysis was limited by a population derived from a rather small geographical area with a relatively homogenous cultural background. Furthermore, the data used in the analysis were cross-sectional. Future research is therefore needed to investigate whether the results hold between different geographical and cultural areas and with objective, longitudinal performance data. Moreover, future research should use confirmatory analyses to validate the results.

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Appendix I – Construct correlations and descriptive statistics

Construct correlations and descriptive statistics of measures (n=197)														
Construct	Mean	SD	ρ_v	ρ_c	α	1	2	3	4	5	6	7	8	9
1 SERVSTRAT	3.91	.86	.74	.92	.88	(.86)								
2 SERVSTRUC	3.83	.77	.64	.84	.71	.69	(.80)							
3 ENDOTECH	3.65	.82	.70	.90	.86	.03	.09	(.84)						
4 EXOTECH	3.80	.77	.66	.86	.75	.19	.19	.63	(.82)					
5 OORG	3.58	.79	.63	.87	.81	.17	.27	.54	.37	(.80)				
6 OPROD	3.50	1.00	.67	.86	.76	.17	.21	.36	.39	.51	(.82)			
7 STDFOCUS	3.76	.81	.65	.85	.73	.02	.03	.53	.41	.53	.38	(.81)		
8 CUSTFOCUS	3.92	.72	.57	.80	.65	.46	.42	.21	.37	.27	.29	.13	(.75)	
9 MPERF	3.30	.95	.71	.88	.79	.21	.12	.31	.20	.28	.14	.34	.20	(.84)
10 FPERF*	3.48	.83	n/a	n/a	n/a	.21	.20	.17	.23	.27	.11	.24	.33	.58
11 SERVOR† (1-2)	-	-	.84	.91	.88	-	-	-	-	-	-	-	-	-
12 TECHOR† (3-4)	-	-	.81	.90	.87	-	-	-	-	-	-	-	-	-
13 OPENNESS† (5-6)	-	-	.75	.86	.83	-	-	-	-	-	-	-	-	-

Note: SD = standard deviation; ρ_v = average variance extracted; ρ_c = composite reliability; Cronbach's alpha (α) = $(\sum_{i \neq h} \text{cov}(x_i, x_h)) / (\text{var}(\sum_{i \neq h} x_i)) (p / (p-1))$ (Tenenhaus *et al.*, 2005); square root of ρ_v on diagonal (in parentheses); * = formative construct; † = second-order construct.

Appendix II – Scale items

Construct and Item	Loading	Weight	
SERVOR			
SERVSTRAT ^a			(Homburg, Hoyer and Fassnacht, 2002)
x ₁	.82	.29	Our marketing strategy emphasizes the importance of services
x ₂	.85	.28	Our solutions are increasingly sold as services
x ₃	.85	.29	Services constitute an important source of competitive advantage in our industry
x ₄	.91	.30	We increasingly respond to customer needs through services
SERVSTRUC ^a			
x ₅	.85	.44	Our organization structure supports well the realization of services
x ₆	.81	.43	Our organization culture is service-centered
x ₇	.73	.38	Our company information systems support the service activity well
TECHOR			
ENDOTECH ^a			(Gatignon and Xuereb, 1997; Zhou <i>et al.</i> , 2005)
x ₈	.86	.29	Our company is among the first to develop new technologies
x ₉	.81	.28	Compared to other companies (in the industry), we possess substantial technological knowledge
x ₁₀	.89	.32	Compared to our competitors, we offer advanced technologies
x ₁₁	.79	.30	Our company culture encourages the development of technological innovations
EXOTECH ^a			(Jaworski and Kohli, 1993; Desarbo <i>et al.</i> , 2005)
x ₁₂	.81	.39	Technological changes provide remarkable opportunities to actors in our industry
x ₁₃	.80	.36	Many novel product ideas in our field have arisen from technological breakthroughs
x ₁₄	.84	.47	Products/services in our business comprise state-of-the-art technology
OPENNESS			
OORG ^a			(Cummings, 1965; Pierce and Delbecq, 1977; Scott and Bruce, 1994)
x ₁₅	.78	.30	Our company culture encourages the search for new ideas outside our organization
x ₁₆	.79	.30	Our organization enables an organization-wide elaboration/testing of ideas
x ₁₇	.79	.31	Our personnel are willing to innovate with people outside their own unit
x ₁₈	.83	.35	Our company has learned that openness speeds up the development and acceptance of new ideas

(Scale items continued)

Construct and Item	Loading	Weight	
OPROD^a			
x19	.76	.43	Collaboration and information sharing are imperative in the development of our products/services
x20	.83	.37	We make use of open source software or OSS components as part of our products
x21	.87	.42	Open source software development is an essential factor in our business
Business model type			
CUSTFOCUS ^a			(Mod. from Narver and Slater, 1990; Theoharakis and Hooley, 2008)
y1	.75	.37	Our customers participate in our solution development work
y2	.73	.34	The development work is carried out in close collaboration with clients
y3	.78	.60	During the last three years, to what extent has your company focused on...enhancing current customer relationships
STDFOCUS ^a			(Mod. from Tether and Tajar, 2008)
y4	.66	.28	Our innovation activity focuses on the development of new products and services
y5	.87	.49	During the last three years, our company has focused on building success based on the development capabilities for new products and/or services
y6	.87	.45	During the last three years, our company has focused on developing products and services new to the industry
Firm performance			
MPERF ^b			(Deshpandé <i>et al.</i> , 1993; Jaworski and Kohli, 1993; Kandemir <i>et al.</i> , 2006)
y7	.90	.46	increased market share (during the last three years)
y8	.77	.36	induced changes in the market (during the last three years)
y9	.86	.36	faster growth relative to competitors (during the last three years)
FPERF ^b			(Deshpandé <i>et al.</i> , 1993)
y10	^c	.59	improved profitability (during the last three years)
y11	^c	.60	increased product/service sales (during the last three years)

Notes: ^a The response options ranged from 1 = "totally disagree" to 5 = "totally agree."
^b Performance indicators measured perceptions of firm performance during the last three years.
The performance rating options ranged from 1 to 5.
^c Formative scale.