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Balancing specialized and generic capabilities in the provision of integrated solutions

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Integrated bundles of products and services are gaining importance in various sectors and are reshaping the competitive landscape of many industries. They also pose new challenges to established firms, who need to reconfigure their capabilities. Drawing upon the resource-based view and contingency theory, we test a model of fit between environmental requirements and integrated solutions capabilities in the IT sector. We used the model to interpret the current industry structure and analyze its dynamics. The analysis suggests the existence of four different configurations and indicates that differences in fit between environmental variables and strategic choices partially account for performance differences among integrated solution providers. The results also suggest that, although the provision of bundled products and services confers some a priori advantages to IS providers over generic IT firms, these advantages are greater for firms that are able to align their capabilities to the characteristics of their operational environment.

JEL classification: L22.

1. Introduction

Integrated solutions (IS) are becoming prevalent in a large number of industries (Galbraith, 2002; Oliva and Kallenberg, 2003; Davies *et al.*, 2006; Windahl, 2006, 2007; Ceci, 2009; Kapletia and Probert, 2009). By the term 'integrated solutions' we refer to 'a business model that combines products and services into a seamless offering that addresses a pressing customer need' (Wise and Baumgartner, 1999: 138). While the simultaneous presence of product and service components can be used to identify an IS, the degree of architectural and managerial complexity, as well

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as the level of product-service complementarity may differ sharply among firms. IS can be positioned along a continuum, starting from the simplest case of a product with a few non-integrated service components, to the more complex example of a fully integrated, end-to-end solution that addresses all customer needs (Davies, 2004). When this is the case, IS become more than a simple bundle of products and services: they 'include product innovations which enable increased process control and optimization of the offering to customers, as well as business innovations which change business models and customer approach' (Windahl, 2007: 3).

The diffusion of IS is particularly significant in the IT sector (Gerstner, 2002; Gager, 2006), where they are rapidly transforming the competitive landscape of the industry. In order to remain competitive in a sector where value creation is shifting from hardware manufacturing or software development to service-oriented activities (Dolbeck, 2007), product and service providers face increasing pressure to supply bundled systems rather than individual subsystems (Tidd *et al.*, 1997). These bundles often linked by proprietary interfaces, may tie customers into a solution with a single point of purchase and after-sales support, and usually guarantee higher margins than stand-alone products or services.

While economically appealing, the provision of bundled products and services poses a number of challenges for IT firms. In this new competitive environment, firms become integrators of components, resources, and services that are developed by external organizations (Brusoni *et al.*, 2001). Supplying IS thus entails a change in the boundaries of the firm (Windahl and Lakemond, 2006). It also requires a redesign of the firm's offers and the reconfiguration of its capabilities (Davies *et al.*, 2006). Compared to firms focusing only on either products or services, IS providers must develop multiple capabilities to address a broader set of customer needs. Faced to highly heterogeneous markets and diversified customer needs, they must also carefully evaluate the trade-off between the development of specialized and generic capabilities, because in today's hypercompetitive markets, the development of multiple capabilities may dilute the firm's core competences and, ultimately, erode its sources of competitive advantage.

Restructuring the organizational architecture of a firm, reconfiguring its internal capabilities, and developing new competences are challenging tasks that can be approached through different strategies. Firms in this industry have developed a variety of different capabilities and have historically followed different paths to become IS providers (Davies *et al.*, 2006). However, none of the strategies adopted has yet emerged as generally superior (Windahl *et al.*, 2004; Davies *et al.*, 2007; Kapletia and Probert, 2009). This suggests that a certain degree of equifinality may exist in this industry. For instance, firms originally specializing in manufacturing must integrate their manufacturing-oriented competences with service-oriented capabilities. However, the delivery of services requires organizational principles and structures that are almost completely new to a product manufacturer. By the same token, service companies that choose to offer bundles of products and services also need

to acquire new competences. This is the case, for instance, for consulting firms such as WS Atkins. Originally, a service-based engineering consultancy, this firm became a provider of bundled systems by launching manufacturing operations and developing new capabilities in systems integration (Davies, 2004).

These examples and the heterogeneity of the approaches followed by IS providers suggest that there is uncertainty about the most appropriate ways to conceive, implement, and manage this activity. They also indicate that the nature of the organizational capabilities required to succeed in this challenge is unclear too. The blurred picture on the practice side is symptomatic of a knowledge gap at the theoretical level as well. Previous studies on this topic have stressed that to become IS providers, firms must develop appropriate capabilities (Wise and Baumgartner, 1999; Galbraith, 2002). Yet, the literature provides limited information on how firms should develop these new capabilities. It also gives little guidance regarding the shaping of IS offers and provides few insights into the factors that affect the current structure and the future evolution of this industry.

Furthermore, although the literature suggests that firms offering IS have several advantages over generic IT firms (i.e. firms that selling software or hardware) (Oliva and Kallenberg, 2003), no conclusive empirical evidence has yet been established about the magnitude and the nature of these advantages.

The purpose of this article is to shed further light on the magnitude and the nature of the hypothesized performance advantages offered by IS. To this end, we propose and test a conceptual model that explains the hypothesized advantages of IS providers by examining the links between the capabilities developed by these firms and the characteristics of the environments in which they operate. The model is used to achieve two related objectives and to make two main contributions. First, it is used to analyze the structure of the industry by uncovering configurations of IS providers in the IT sector Specifically, we seek to determine whether firms in this industry develop capabilities in line with the degree of heterogeneity of the market in which they operate. Recognizing the need for exploratory research in this field and following the increasing interest received by organizational gestalts (Meyer *et al.*, 1993; Bensaou and Venkatraman, 1995; Dennis and Meredith, 2000; Aksin and Masini, 2008), we follow a configurational approach. The establishment of configurations is a useful contribution to the emerging literature on IS and IT, because 'taxonomies provide parsimonious descriptions which are useful in discussion, research and pedagogy' (Miller and Roth, 1994: 286).

As a second objective, the model is used to examine whether IS providers have an advantage over generic IT firms and to test the hypothesis that to maximize performance, these firms should develop capabilities that fit the requirements of the environment in which they operate. By examining performance differences between IS providers and generic IT firms and among configurations and by assessing the value of specialization in different environments, we shed light on the factors that influence the success of IS projects and that ultimately shape the dynamics of this industry.

The remainder of this article is organized as follows. In Section 2, we review the relevant literature; then in Section 3 we draw upon contingency theory and the resource-based view to develop a theoretical model of fit between the environmental requirements of IS providers and the types of capabilities they develop. Section 4 describes the data collection process and the analytical procedure employed to test the model. In Section 5 we discuss the results, specifically the four typical configurations that emerge from the analysis. Section 6 concludes with a summary of the limitations of the study and an indication of some avenues for future research.

2. Literature review

The literature on IS has focused primarily on two main topics. A first stream of literature has examined the drivers that induce firms to offer IS (Slywotzky, 1996; Hax and Wilde, 1999; Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003). A second stream of literature has analyzed the changes that must be implemented by organizations adopting the new business model (Nambisan, 2001; Galbraith, 2002; Sandberg and Werr, 2003; Windahl *et al.*, 2004; Windahl, 2007).

Studies in the first category have suggested that the emergence of IS is primarily due to changes occurring in the external environment. In certain industries, increasing customer sophistication and the emergence of low-cost players have undermined the profitability of traditional sales channels. To remain competitive, traditional players are often obliged to add high-value services to physical products, thereby becoming de facto IS providers (Slywotzky, 1996). Along the same lines, Oliva and Kallenberg (2003) have identified three primary reasons that underpin the trend towards IS. First, the trend is driven by an economic rationale, because bundled products and services have longer life cycles and guarantee higher revenues than stand-alone products. Second, IS are motivated by marketing drivers, as they can be used to satisfy the increasing demand for services. Finally, IS offer competitive benefits, because they are more difficult to replicate and thus offer more opportunities to achieve and defend a competitive advantage.

The second literature stream has focused on the transition from product-based to service-based competition and on the organizational characteristics of IS providers. The provision of IS requires important organizational and strategic changes on the part of traditional product-oriented companies. Solutions providers must restructure their organizations around customers (Galbraith, 2002; Davies *et al.*, 2006), because offering a solution means solving a customer problem rather than selling a product. Companies must also address a whole new set of customer needs: from a customer perspective, buying an IS is tantamount to outsourcing some activities in order to focus on the core business (Wise and Baumgartner, 1999). Scholars explored also the organizational structure implemented by solution providers. Davies and Hobday (2005) identified a project-based organization as the predominant organization mode, because this is the one that enables solution providers to address their customers' needs

most effectively. To respond to continuous shifts in strategy, IS providers are organized following a 'front/back' model. Firms form front-end units that develop, package and deliver the solutions, while their back-end units supply standardized, solution-ready components (Galbraith, 2002; Davies and Hobday, 2005). The balance between the standardized modules provided by the back-end and the customized activities of the front-end differentiates the offer of different providers.

Scholars from various fields have paid attention to the different organizational models and strategic approaches adopted by IS providers. The need to develop dedicated organizational architectures when providing systems rather than single components had been already noted in the works of Hannaford (1976) and Page and Siemplenski (1983). Other contributions in the field of marketing have pointed out that the provision of systems rather than single components forces firms to explore alternatives for improving their organizations (Paliwoda and Thomson, 1985; Araujo and Spring, 2006). Drawing upon these studies, Davies *et al.* (2007) have observed the coexistence of two opposite approaches to the provision of IS: those of system sellers and system integrators.

Though distinguished, these studies point toward several gaps still remaining in the literature. First, despite the growing interest for IS, no conclusive empirical evidence has yet been established regarding the advantages of these solutions. Second, the coexistence of contrasting strategies signals that firms providing product-service bundles face complex choices. It has been observed that firms arrive at IS from various backgrounds and that a unique approach cannot be identified in the industry. This suggests that a certain degree of equifinality may exist, which leave room for differentiation in the industry. Third, while some studies have begun shedding light on the organizational models adopted by IS providers, they have not yet examined the performance implications of these models. For instance, it is still unclear whether strategies based on specialization (such as those adopted by system sellers) should be preferred to those focusing on the development of multiple capabilities. Finally, only limited attention has been paid to the role of the operational context in determining the effectiveness of these strategies.

These observations constitute the point of departure for our analysis. Building upon these emerging streams of literature, we aim to portray the most relevant approaches to the provision of integrated IT solutions, to assess whether they provide advantages over the sale of mere hardware or software and to determine whether their effectiveness is contingent on the firm's operational environment.

3. Conceptual model and research hypotheses

3.1 Theoretical background

To shed light on the factors that affect the strategies and performance of IS providers, we use two main theoretical anchors: the resource-based view of the firm (RBV) and

the contingency (or structure-environment) perspective. The RBV assigns central relevance to internal resources and capabilities as the sources of a firm's competitive advantage (Ansoff, 1965; Barney, 1991) and clarifies the nature and role of these variables in the provision of IS. Organizational capabilities are the outcome of a resource integration process that is enabled and supported by knowledge (Chandler, 1990; Grant, 1996, 2002). When they are valuable, rare, inimitable, and nonsubstitutable, resources can guarantee the achievement of competitive advantage, especially if they are integrated into a unique set of capabilities. However, being knowledge-based, organizational capabilities are also 'sticky' and difficult to modify (Teece *et al.*, 1997), because firms present a certain degree of organizational inertia that does not allow for quick and painless change.

Management scholars have also stressed that capabilities are not static and immutable, but rather dynamic (Teece and Pisano, 1994; Zollo and Winter, 2002). When competitive landscapes shift continuously, market boundaries are blurred, and business models become unclear, the achievement of sustained competitive advantage is guaranteed only by the ability to continuously reorganize and reconfigure internal resources to match changes in the external environment. The dynamic nature of organizational capabilities creates path-dependency (Eisenhardt and Martin, 2000), which further increases their stickiness. Organizations thus should not ignore the capabilities they already possess when they make strategic choices in the provision of IS. A software development company that starts providing IT consulting services will never possess the same capabilities as an IT consultancy firm that moves into software development. The two firms will choose different strategies for the provision of IS: that is, they will target different markets, they will sell to different customers, and they will offer solutions with different technical characteristics.

The structure-environment perspective offers a second theoretical lens for the analysis of IS. This theory posits that there is a link between environmental context, organizational structure, and performance (Duncan, 1972; Drazin and Van De Ven, 1985; Venkatraman, 1989). Contingency scholars argue that a strategy is successful only if there is fit (i.e. a degree of internal coherence) between existing capabilities and external environmental contingencies (Venkatraman, 1989). This conceptualization of fit can be used to obtain configurations of different contingencies, each having distinctive implications for organizational design (Child, 1975).

A direct implication of the structure-environment perspective is that there is no such thing as a single best strategy in the provision of IS. Superior performance can be achieved only when organizational capabilities are combined coherently to match the characteristics of the competitive environment in which the firm operates. Building upon the literature contributions summarized above, and drawing upon the conceptualization of fit as gestalts, i.e. clusters of units that display coherence among a set of theoretical attributes (Miller, 1981; Venkatraman, 1989) we propose the conceptual model illustrated in Figure 1 and discussed in the next section.

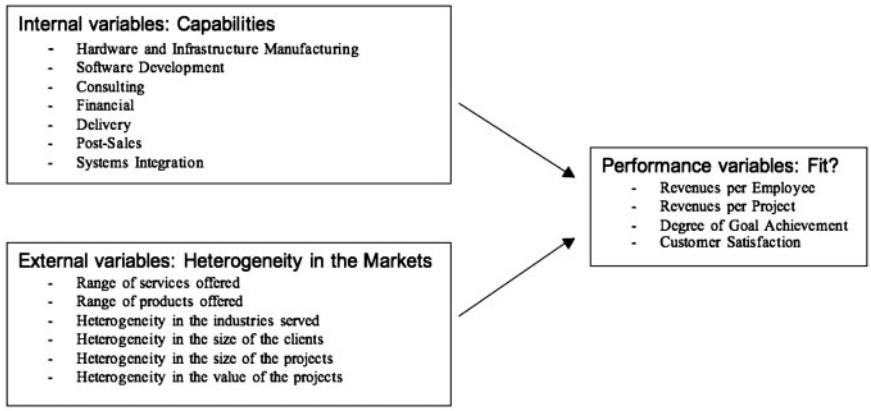

Figure 1 Theoretical model.

3.2 Conceptual model of fit

3.2.1 Capabilities for the provision of IS

Organizational capabilities play a paramount role in the success of integrated IT solutions and offer a useful lens for the analysis of the strategies of their providers (Galbraith, 2002; Davies *et al.*, 2006; Davies *et al.*, 2007). A review of the literature in this area (Ceci and Prencipe, 2008) suggests that firms need seven key capabilities to provide integrated IT solutions:

Software development capabilities include the design, development, and testing of software, whereas *hardware and infrastructure manufacturing capabilities* include the manufacturing and assembling of hardware products (computers, servers, workstations, or other electrical equipment), as well as other physical tasks associated with the installation of networks and cables (Davies, 2004; Ceci and Prencipe, 2008). These two sets of capabilities are distinguishing characteristics of IS providers because they differentiate these providers from pure IT consultants.

Consulting capabilities represent the ability of an organization to understand the needs of its customers and to tailor solutions to those needs. Because integrated IT solutions must address customer needs from end to end, adequate consulting capabilities play a central role. Firms with inadequate consulting capabilities risk building useless solutions, which are both ineffective and expensive to maintain and upgrade (Slywotzky and Wise, 2003).

Financial capabilities include all the activities through which IS providers offer financial assistance to their customers, for example, the provision of leasing and flexible payment structures and the offering of competitive interest rates and/or buyout options (Brady *et al.*, 2005). These services offer a high value-added to clients, who can count on a proper turnkey solution. However, they are also difficult to develop, because they require competences outside the core business of IT firms

(Dietrickx and Cool, 1989; Sanchez, 1995). For an IS provider, the development of financial capabilities is an effective way to differentiate its offers from those of its competitors.

Delivery capabilities include the capability to deliver hardware and software (including software customization). Software customization is a critical capability that needs to be managed by every solution provider (Davies, 2004; Ceci and Prencipe, 2008). It is particularly critical for firms offering complex packages, such as ERP, which need to be customized to fit the characteristics of the client.

Post-sales capabilities include activities related to hardware maintenance, software assistance, software problem solving, and user training (Slywotzky and Wise, 2003; Windahl *et al.*, 2004; Brady *et al.*, 2005). They are fundamental because of the very nature of the products sold: it is nearly impossible at the present time to sell software without post-sales assistance, especially in B2B environments.

Systems integration capabilities consist of the ability to integrate products, services, and different technologies. Systems integration plays a central role in the provision of IS, because different technological platforms must communicate to assure a seamless flow of data and information. Likewise, products, subsystems, and services must also be fully integrated to address the increasing demand for speed and effectiveness that characterize the markets for IT applications. Empirical evidence shows that these are by far the most difficult capabilities to develop and are also a very critical component in the provision of IS (Brusoni *et al.*, 2001; Prencipe *et al.*, 2003).

By selectively allocating resources to the different activities above, IS providers shape the nature of their offers and the characteristics of their capabilities. Firms that decide to develop specialized capabilities in a particular domain focus on a subset of the above activities (e.g. systems integration). Firms that choose to develop generic capabilities allocate resources more evenly among the various activities. Accordingly, we propose the following definition:

> *Definition 1: IS providers display specialized capabilities when they concentrate their resources on a limited set of core activities. IS providers display generic capabilities when they spread their resources evenly among a wide range of activities.*

3.2.2 Environmental variables and strategic choices

Contingency theorists have analyzed several environmental characteristics with the objective of understanding how firms should adapt their organizational structures, strategies, or capabilities to different environments. A number of variables have been examined, including turbulence (Ansoff, 1979), dynamism (Mintzberg, 1979), speed (Eisenhardt, 1989), uncertainty (Galbraith, 2002), and heterogeneity (Perrow, 1967). Among these characteristics, heterogeneity plays a very central role in shaping organizational capabilities (Osborn and Hunt, 1974; Pfeffer and Leblebici, 1973). IS providers can affect the degree of heterogeneity of their operational environment

by making three types of choices: they can select the mix of products/services to deliver; they can choose the types of markets to target; and, finally, they can decide how to organize and manage the projects. These decisions create three specific types of heterogeneity: in the offers, in demand, and in the type of projects.

Heterogeneity in the offers accounts for the range of services as well as the range of products offered by the solution provider. Firms operating in service-oriented markets will require different capabilities than firms in product-oriented markets, because these markets have different characteristics (Easingwood, 1986; Hill, 1999). As IS include both products and services, the relative proportion of products and services in the offers effectively differentiates firms operating in niche markets from those operating in the mass market.

Heterogeneity in demand includes heterogeneity in the industries served and in the size of the clients, because both factors can affect the type of capabilities required to provide IS. Scholars have emphasized the role played by customer demand in determining performance, shaping innovation, and developing capabilities (Adner and Levinthal, 2001; Adner and Zemsky, 2006). With the increasing sophistication of customer requirements and the recent widespread diffusion of industry-specific IT products, 'one-size-fits-all' approaches to the provision of IT solutions are proving increasingly ineffective. Rather, IT providers need to develop industry-specific capabilities that can effectively address the needs of their clients in different industries.

Heterogeneity in projects takes into account heterogeneity in both the size and the value of the IT solutions provided. As IT solutions providers are project-based organizations, the characteristics of the projects they manage have a central role in shaping their operational environment (Davies, 2004; Brady *et al.*, 2005). The length and the value of a project significantly affect its complexity and its risk; in turn, complexity and risk have an impact on the type of capabilities and organizational structure that a solution provider needs to put into place to successfully manage the project (Hobday, 2000; Davies and Hobday, 2005). Based on the above characterization, we propose the following definition:

> *Definition 2: IS providers operate in heterogeneous environments when they offer a wide range of products and services, serve different customers, and develop projects of different sizes and values. IS providers operate in homogeneous environments when they offer a limited range of product and services, serve similar customers, and develop projects of similar size and value.*

3.2.3 Research hypotheses

The literature on IS has identified several benefits of IS, such as the possibility for IS providers to better address customers' needs (Wise and Baumgartner, 1999), or to introduce business innovations (Windahl, 2007). In line with this perspective, we contend that, regardless of the specific strategic choices made by the firm, IS offer

several advantages. The integration of products and services in a unique bundle enables IS providers to addresses specific customer needs at a competitive cost. In turn, this ability should confer them an edge over generic IT firms (pure software vendors or pure hardware manufacturers). For instance, due to the higher degree of customization and to the tailor-made solutions that IS providers can offer to customers, they can charge higher prices without necessarily incurring proportionally higher costs. Morevoer, as it has been underlined by the product bundling literature, firm offering bundled products and services reduce their costs in transaction and information exchange (Adams and Yellen, 1976). Finally, it has been observed that in the production process of bundled goods it is often possible to obtain scale efficiencies (Bakos and Brynjolfsson, 1999). Therefore we propose the following hypothesis:

> *H1: Regardless of the degree of specialization of their capabilities and of the degree of heterogeneity of their environment, IS providers have performance advantages over generic IT firms.*

Most of the available literature on IS and the above hypothesis suggest that IS providers should have advantages over generic IT firms, but they do not account for the heterogeneity observed across these firms and do not explain how it originates. To this end, the structure-environment perspective offers a useful theoretical lens for the analysis of the strategic decisions of IS providers and for understanding the performance differences among them. First, this theory suggests that under norms of administrative rationality a firm should match its internal organizational complexity with its environmental complexity (Thompson, 1967). By choosing their markets, their target customers, and the appropriate mix of products and services, IS providers affect the degree of heterogeneity of their operational environment. We suggest that rationally managed firms should frame their product/market/customer choices so that the resulting environmental heterogeneity is consistent with the organizational capabilities they possess. We therefore propose the following hypothesis.

> *H2: IS providers tend to make strategic choices in such a way as to align their organizational capabilities with the degree of heterogeneity of their operational environment.*

Moreover, the structure-environment perspective also suggests that the selection of coherent combinations of organizational capabilities and operational environments should have performance implications. The importance of aligning internal and external factors and the performance implications of specialization have been extensively examined in operations strategy (Skinner, 1974; Hayes and Wheelwright, 1979; Smith and Reece, 1999). Researchers in this area devoted their attention to understand how firms should develop capabilities and design their processes in line with their competitive priorities (Miller and Roth, 1988). Furthermore, since the seminal work of Skinner (1974) on the focused factory, the importance of focusing on a few,

narrowly defined, competitive capabilities has been clearly established. As the development of multiple capabilities comes at a cost and entails the risk of losing focus, firms should choose this strategy only if their environment requires it (Anad and Ward, 2004).

Coherently with this view, we argue that IS providers that operate in a large number of different industrial sectors will tend to develop a wider range of capabilities than firms specializing in one industry. Likewise, companies that target customers of different sizes and manage different projects will tend to develop multiple capabilities and more flexible organizations than solution providers that specialize in the provision of a specific solution. We expect that firms possessing specialized capabilities should obtain greater benefits when they operate in homogeneous environments. The possession of specific knowledge about a restricted number of customers in a given industry, as well as the development of dedicated products and services, should give these organizations a competitive advantage that cannot be easily matched by firms with generic capabilities. They can customize their offers to match specific customers' needs and achieve greater economies of scale in doing so.

Yet IS providers may find heterogeneous environments more profitable, because these contexts offer greater opportunities to access new customers and markets. Heterogeneous environments also facilitate diversification, thereby decreasing the risk of being affected by changes in one particular market (Keats and Hitt, 1988; Hitt *et al.*, 1997). However, heterogeneity requires multiple capabilities, because companies operating in these environments must address a broader set of customer needs. Firms with specialized capabilities should consider entry into heterogeneous markets with care, because the need to develop multiple generic capabilities does not facilitate customization, may dilute their core competences, and ultimately may expose them to the risk of being outperformed by more focused companies. Accordingly, we propose the following hypothesis:

> *H3: IS providers that display fit between the degree of specialization of their capabilities and the degree of heterogeneity of their operational environment have performance advantages over IS providers that do not display fit between these dimensions.*

4. Methods

4.1 Data collection: sample selection and questionnaire administration

The data for this study were obtained via a survey of a sample of IS providers operating in the IT sector. In a first phase, extant literature and empirical evidence were used to generate valid items to measure the constructs in our theoretical model. The literature review focused on four topics: IS, systems integration, project-based

organization, and firm boundaries (Williamson, 1975; Prencipe *et al.*, 2003; Cerasale and Stone, 2004; Davies and Hobday, 2005). This review was then supplemented with a multiple case study analysis. Ten IT solutions firms operating in Italy were examined through an analysis of documentary and archival data and interviews with project managers, marketing directors, and sales directors. To clarify the research goal, in the cover letter accompanying the questionnaire we provided the following definition of IS, derived from the seminal work of Wise and Baumgartner (1999): 'With the term IS we refer to the offer of a turnkey bundling of products and services customized around specific customer needs' (Wise and Baumgartner, 1999: 138). Starting from this definition, interviewees were asked to describe, for a typical IS project, the phases, activities performed, capabilities required, organizational form adopted, level of standardization/customization of the solution, and problems and criticalities, as well as the role played by external suppliers of products and services in the provision of the solution. Together with the analysis of the literature, this allowed for the establishment of a taxonomy of IS capabilities and the identification of items describing the characteristics of the solutions (Ceci and Prencipe, 2008).

In the second phase of data collection, the items were coded into a questionnaire and submitted to a sample of IT solution providers in Europe. To assure homogeneity in the sample, the survey was restricted to four countries that were representative of the overall population of IT solution providers in Europe and offered favourable opportunities for data collection: Italy, Spain, the UK, and Sweden to maximize the accuracy of responses, the questionnaire was prepared in the native language of the respondents (with the exception of Sweden, where English was used). The survey was written initially in English and was then translated into Spanish and Italian. The Italian and Spanish versions were then translated back into English by a second translator to check their accuracy and to eliminate inconsistencies (Bensaou and Venkatraman, 1995). Each version of the questionnaire was pretested with industry representatives to ensure that the target informants understood the wording and that the Italian and Spanish versions were valid translations.

The sample selection was based on an ad hoc sampling procedure. As there was no extant database of IS providers, we developed a procedure to estimate this population and from that population extracted a sampling frame. We used the Amadeus database of European Companies to construct the population of generic IT firms. Since firms that provide IS are former software houses, hardware producers, and consultancy firms, we considered the following NACE codes: 3001 and 3002 (manufacture of office machinery and computers), and 7210, 7221, 7222, 7230, 7240, 7250, and 7260 (computer and related activities). We then selected a random sample of 200 firms from the population and examined them in great depth to ascertain whether they provided IS. The assessment was based on a careful analysis of the companies' web sites as well as on a detailed review of business magazines and articles in the press. In this way, we obtained the percentage of generic IT firms that moved into the IS business, stratified by number of employees (Table 1), and computed the

Table 1 Distribution of firms providing integrated solutions

No. of employees	Percentage of firms offering integrated solution
20–99	47
100–499	50
>500	100

Table 2 Population and sample characteristics

	Location	No. of employees			
		20–99	100–499	>500	Total
Firms operating in the IT sector (*Source*: Amadeus database)	Italy	895	293	65	1253
	UK	1791	792	202	2785
	Sweden	610	131	29	770
	Spain	813	301	56	1170
	Total population (%)	4109 (69)	1517 (25)	352 (6)	5978
Firms offering integrated solutions	Italy	421	147	65	632
	UK	842	396	202	1440
	Sweden	287	65	29	381
	Spain	382	150	56	588
	Total population (%)	1932 (63)	758 (25)	352 (12)	3042
Sample	Italy	20	6	4	30
	UK	16	4	7	30
	Sweden	12	7	4	23
	Spain	11	5	3	19
	Total (%)	62 (61)	23 (22)	17 (17)	102

population of IT IS providers. Finally, to select the sampling frame from this population of 3042 firms (Table 2), we randomly chose 40 firms from each country, yielding a final sampling frame of 160 firms. We obtained contacts for these firms from IT professional associations, alumni databases from business schools and universities, and distribution lists from specialized newspapers and from the House of Commerce.

As a side note, it is interesting to observe that the provision of IS is significantly more common among large firms. We believe there are at least two good reasons for

this phenomenon. First, extending the offer to include products and services require resources and capabilities that may not be widely available to small firms. Second, some small firms may even deliberately decide to concentrate all their efforts on one specific activity (either product- or service-oriented) because they believe specialization can confer a distinctive advantage over larger firms.

Because respondents needed to have a direct and personal involvement in an IS project in order to answer the questionnaire, the ideal respondent was identified as a project manager who had completed at least one project with the firm. In order to guarantee that the data collected at the project level could be used as a reliable proxy for all of the firm's activities, project managers were asked to refer to a project that was highly representative of the activities of the company (i.e. within the class of projects that generated the largest proportion of revenue for the organization) (Subramaniam and Venkatraman, 2001). To increase the response rate, we guaranteed that all the data would remain absolutely confidential and would be used only for academic purposes; we also promised to provide personalized feedback benchmarking the respondent's firm against a representative sample.

Telephone interviews were chosen as the preferred mode of data collection because they allowed the researcher to complement the data from the questionnaire with qualitative information that could be used to better characterize the firms. To set up interviews, a researcher first contacted the firms in the sampling frame via e-mail and made follow-up calls one week after the first message. In both cases the researcher briefly explained the aim of the research and the content of the questionnaire and asked to arrange a phone meeting with a project manager. This administration method yielded a 64% response rate, which is higher than other studies of this nature (Miller and Roth, 1994; Bensaou and Venkatraman, 1995). The final sample contained 102 firms (Table 2). Of the firms that participated in the survey, 75% completed the questionnaire during the phone interviews and 10% during face-to-face interviews. For the remaining 15% of firms, the survey was self-administered, with the researcher making follow-up calls to clarify the responses as needed. To maximize the accuracy of responses, the interviews were conducted in the native language of the interviewee (again with the exception of Sweden, where the interviews were conducted in English). A Wilcoxon signed-rank test on the firm size confirmed that the sample distribution was not significantly different from the population ($P = 0.019$). Details of the survey and the relevant descriptive statistics are included in the Appendix Table A1.

The test of Hypothesis 1 required the generation of a control sample of generic IT firms (i.e. firms that do not offer IS). To this end, we first identified the population of pure software vendors and pure hardware manufacturers in the four countries of our survey. We then extracted a random sample from this list, to match the number of firms in our research sample. A Wilcoxon signed-rank test on the firm size confirmed that there were no statistical differences between the two groups.

In order to match the characteristics of the research sample, our control sample had to include a similar (i.e. small) percentage of large firms. As observed, these firms are more inclined to be IS providers, which implies that the control sample contained a small percentage of IS providers as well. We believe that the noise introduced by this procedure did not affect our results, for three valid reasons. First, the performance of firms in the research sample refer to their IS business units only, not to the entire firm (as it is the case for the control sample). Second, the percentage of large firms (i.e. those 'naturally' more inclined to offer IS) in the two samples is extremely low. Therefore, the contribution of IS to business performance is significantly smaller in the control sample than in the research sample. Finally, had a bias been introduced, it would make the falsification of Hypothesis 1 easier not more difficult, because the presence of some IS providers in the control sample reduces performance differences between the two groups rather than amplifying them.

4.2 Operationalization of variables

We operationalized the taxonomic variables that define heterogeneity as follows. Heterogeneity in the offer was operationalized by means of two indicators (RANGE_PROD and RANGE_SERV) reflecting the range of products and services included in the offer and developed internally. To allow us to compute the indicators, project managers were given a list of activities and asked to indicate whether and how the firm provided these activities. The list of activities (reported in the Appendix Table A1) was based on the results of the analysis of the data collected in the exploratory phase of the research (Ceci and Prencipe, 2008). The two indicators were then constructed as follows:

$$\text{RANGE\_PROD} = \frac{\Sigma i(x_i \times a_i)}{N} \tag{1}$$

$$\text{RANGE\_SERV} = \frac{\Sigma i(x_i \times b_i)}{N} \tag{2}$$

where x_i is the activity score reported in the questionnaire and coded according to the following key: 3, if the activity was included in the offer and managed in-house; 2, if included in the offer and managed both in-house and externally; 1, if included in the offer but managed by external providers only; and 0, if not included. a_i is the product-specific weight of activity i based on its product content. b_i is the service-specific weight of activity i based on its service content. N is the number of activities examined.

The heterogeneity of customers was measured using two Herfindahl–Hirschman concentration indices, one for the percentage of clients of different sizes (H_SIZECL), and one for clients operating in different industries (H_IND). The heterogeneity of projects was also measured by means of two Herfindahl–Hirschman indices applied to the length (H_SIZEPR) and the value

(H_VALUEPR) of IS projects. Low values for these indices indicate heterogeneous environments, whereas low values of the product and service range indices, in contrast, indicate homogeneous environments. A factor analysis on the six heterogeneity indices confirmed the existence of three factors representing the three types of heterogeneity.

The taxonomic variables defining the type of capabilities were measured using multi-item scales. For each of the seven activities, respondents were asked to assess through 5-point Likert scales its importance for the business; the frequency of provision of the activity; the involvement of external suppliers; and the percentage of work conducted internally. To operationalize the capability variables we first performed a factor analysis on the 28 items with varimax orthogonal rotation, which supported the retention of the seven factors suggested in the literature (Ceci and Prencipe, 2008). The capability variables were then formed by aggregating the items tapping into each construct, weighted by their respective factor scores. We conducted several tests to assess the psychometric properties of the measures. Cronbach's alpha values varied from 0.84 to 0.96 for each measure, thus providing strong evidence of construct reliability. To establish convergent and discriminant validity, we performed a confirmatory factor analysis (Hair *et al.*, 1998). We tested the measurement models through partial least squares (PLS), a structural modeling technique with small sample-size requirements (Wixcom and Watson, 2001). The results provided strong evidence of convergent validity: the average variance extracted (AVE) exceeded the recommended cutoff value of 0.50 for all scales. Factor loadings also exceeded the recommended cutoff value of 0.60. In addition, the results provide evidence of discriminant validity. The squared root of the AVE value of each construct was larger than the correlation between that construct and all other constructs. In Table 3 we report the factor loadings, Cronbach's alpha values, and AVE values for the seven capabilities.

We measured the two aggregated variables that assess environmental homogeneity and the degree of specialization of organizational capabilities as follows. The average degree of environmental homogeneity was measured by aggregating the factor scores obtained from the factor analysis of the six heterogeneity indices. The degree of specialization of capabilities was computed as the variance of the seven capability indices. Low levels of variance across the seven indices constitute evidence of firms with generic capabilities that allocate resources evenly among various activities. Conversely, high levels of variance are associated with specialization, as they indicate uneven resource allocation profiles across the seven capabilities. We also characterized the seven capabilities with respect to their degree of customizability to customer-specific needs. We calculated this variable by multiplying each capability index by its specific degree of customizability (measured via a dedicated 5-point Likert scale) and averaging these measures over the seven capabilities. Finally, to assess the fit between the capabilities and the environment, we computed a misfit

Table 3 Measurement scales for the seven capabilities

Construct and questionnaire items	Loading	*t*-stat.	Construct and questionnaire items	Loading	*t*-stat.
Hardware and infrastructure mfg. (CR = 0.95; AVE = 0.82)			*Delivery (CR = 0.89; AVE = 0.68)*		
Importance for the business	0.89	20.22	Importance for the business	0.83	17.83
Frequency of provision	0.93	40.94	Frequency of provision	0.77	12.23
Involvement of external suppliers	0.94	55.33	Involvement of external suppliers	0.82	18.11
Percentage of work done internally	0.88	21.30	Percentage of work done internally	0.85	25.45
Software development (CR = 0.97; AVE = 0.89)			*Post-sales (CR = 0.89; AVE = 0.69)*		
Importance for the business	0.97	118.65	Importance for the business	0.81	9.36
Frequency of provision	0.9	41.9	Frequency of provision	0.77	8.41
Involvement of external suppliers	0.95	84.02	Involvement of external suppliers	0.82	25.84
Percentage of work done internally	0.96	74.38	Percentage of work done internally	0.89	39.89
Consulting (CR = 0.93; AVE = 0.78)			*Systems integration (CR = 0.91; AVE = 0.71)*		
Importance for the business	0.88	26.56	Importance for the business	0.86	11.17
Frequency of provision	0.84	23.36	Frequency of provision	0.77	9.95
Involvement of external suppliers	0.89	42.13	Involvement of external suppliers	0.85	26.46
Percentage of work done internally	0.91	45.85	Percentage of work done internally	0.90	35.71
Financial (CR = 0.97; AVE = 0.88)					
Importance for the business	0.94	52.97			
Frequency of provision	0.95	57.96			
Involvement of external suppliers	0.97	111.63			
Percentage of work done internally	0.89	24.59			

variable as the squared difference between the standardized values of the homogeneity and specialization indices.

To assess performance differences between IS providers and generic IT firms, we used four firm-level indicators as dependent variables: revenue per employee, profit margin as well as the changes occurred in these two variables from 2 years before the survey until the year of the survey. In addition to the above firm-level variables, to assess performance differences between the different configurational arrangements of IS providers, we also used three project-level indicators: revenue per project, the degree of goal achievement and a customer satisfaction index calculated using a self-reported, 5-point Likert scale. Data to compute financial measures of performance were obtained from public databases (Amadeus). Other project-based performance measures were self-reported. For all the self-reported measures, we tested for common method variance (CMV) using Harman's single factor test (Podsakoff *et al.*, 2003). Results (available upon request) showed no evidence of CMV.

4.3 Analytical approach

To test Hypothesis 1, we conducted a comparison between the sample of IS providers and the control sample of generic IT firms against the four firm-level performance variables. To test Hypothesis 2 and identify configurations of IS providers, we applied a clustering algorithm to the sample of 102 companies, using the six capabilities and seven heterogeneity indices in Figure 1 as taxonomic variables. Following the recommendations provided in Punj and Stewart (1983) and Ketchen and Shook (1996), we standardized the taxonomic variables to limit the spurious influence of different scales; we used the squared Euclidean distance as similarity measure; and we employed the Ward's minimum variance method to form clusters.

We used a two-stage clustering procedure to determine a final solution and to minimize the impact of outliers (Menor *et al.*, 2001). In the first stage, we conducted a hierarchical clustering analysis using Ward's method and eliminated from the sample the 10% of the observations that had the largest multivariate distance from the others (i.e. potential outliers). Then, to identify the number of clusters, we looked for pronounced increases in the tightness of clusters as measured by the R^2, the cubic clustering criterion, and the pseudo-F statistic (Milligan and Cooper, 1985), and for managerial interpretability of the clusters (Ketchen and Shook, 1996; Hair *et al.*, 1998). The initial Ward's solution was used to identify the initial seeds for the second-stage analysis, in which we used an iterative K-means approach to search for improved solutions. The analysis, conducted with the CLUSTER and FASTCLUS procedures in SAS 9.1, generated a four-cluster solution containing 41, 15, 24, and 11 observations. The four clusters were named *off-the-shelf solution providers*, *resellers*, *industry specialists,* and *technologists*.

We used several tests to assess the robustness and the validity of the solution. An overall multivariate test of significance using the Wilks' lambda criterion and the

Table 4 Jackknife cross-validation of observations

From cluster	Assigned to cluster				
	Off-the-shelf solution providers (%)	Resellers (%)	Industry specialists (%)	Technologists (%)	Total (%)
Technologists	**40 (98)**	1 (2)	0 (0)	0 (0)	41
Off-the-shelf solution providers	0 (0)	**14 (93)**	1 (7)	0 (0)	15
Industry specialists	2 (8)	0 (0)	**21 (88)**	1 (4)	24
Resellers	1 (9)	1 (9)	0 (0)	**9 (81)**	11
Misclassification rate	2	7	13	18	10

associated F statistic indicated that the null hypothesis that the four clusters were equal across all defining variables could be rejected with $P<0.0001$ (Miller and Roth, 1994). We also conducted a jackknife cross-validation analysis (Miller and Roth, 1994; Menor *et al.*, 2001), to assess whether the proposed classification criterion correctly classified future observations (Table 4). The analysis indicated a group-specific error-count estimate (proportion of misclassified observations) of ~9%, which is acceptable for this type of study (Menor *et al.*, 2001). Finally, to test the statistical power of the configurations, we performed a series of one-way comparisons among the four clusters using the 13 taxons as discriminating variables.

Finally, to assess the external validity of the proposed configurations (Ketchen and Shook, 1996) and test Hypothesis 3, we compared clusters against the four firm-level and the three project-level performance variables and also against the degrees of specialization and customization of their capabilities, the degree of environmental heterogeneity, and their degree of misfit. We also controlled for differences in age and size. Results of the correlation analysis are reported in Table 5.

5. Discussion of results

5.1 Descriptive validity: characteristics of the four configurations

Before analyzing performance differences among IS providers and between IS providers and generic IT firms, it is worth examining the characteristics of the configurations identified through the cluster analysis. The four configurations can be characterized with respect to their respective group centroids (means) of the 13 taxonomic variables (Table 6). The results show that 9 of the 13 variables included

Table 5 Pearson bivariate correlations ($N = 91$)

	1	2	3	4	5	6	7	8	9	10	11
1 Firm size	1.00										
2 Project size	−0.05	1.00									
3 Project value	0.27***	0.34***	1.00								
4 Homogeneity	0.03	−0.08	−0.06	1.00							
5 Specialization	−0.10	−0.07	0.03	−0.05	1.00						
6 Revenue/employee	0.01	0.18*	0.36***	0.09	0.17	1.00					
7 Revenue/project	0.01	0.30	0.57***	0.03	0.10	0.56***	1.00				
8 Goal achievement	−0.07	−0.07	−0.14	0.25***	0.09	−0.30***	−0.13	1.00			
9 Cust. satisfaction	−0.08	−0.05	−0.15	0.19*	0.11	−0.30***	−0.12	0.87***	1.00		
10 Profit margin	0.16	−0.07	0.14	−0.03	−0.01	0.02	0.10	0.16	0.17	1.00	
11 Δ Profit margin	−0.07	0.17	−0.08	−0.11	0.10	0.02	−0.11	0.12	0.03	0.18*	1.00
12 Δ Revenue/employee	−0.16	0.12	−0.05	0.02	0.12	0.02	−0.11	0.01	0.05	−0.02	0.32**

*Significant at the 0.1 level. ***Significant at the 0.01 level.

Table 6 Characteristics of the clusters

	Off-the-shelf solution providers ($n=41$)	Resellers ($n=15$)	Industry specialists ($n=24$)	Technologists ($n=11$)	F-value (probability)
Variables that define the type of capabilities[a]					
Hardware and infrastructure manufacturing capabilities					
Cluster mean	−0.38 (4)	−0.35 (4)	−0.24 (4)	**1.79** (1, 2, 3)	49.73
SD	0.18	0.26	0.52	1.31	<0.0001
Software development capabilities					
Cluster mean	−0.19 (3)	−0.02	**0.44** (1)	0.03	2.18
SD	1.08	1.03	0.78	0.75	0.09
Consulting capabilities					
Cluster mean	**0.40** (3)	0.08 (3)	−0.68 (1, 2, 4)	0.33 (3)	8.19
SD	0.50	0.83	1.41	0.33	<0.0001
Financial capabilities					
Cluster mean	−0.33 (2)	**0.85** (1, 3, 4)	−0.39 (2)	0.06 (2)	10.41
SD	0.46	1.44	0.07	1.14	<0.0001
Delivering capabilities					
Cluster mean	**0.33** (2)	−1.37 (1, 3, 4)	0.28 (2)	0.08 (2)	22.65
SD	0.47	1.46	0.41	0.42	<0.0001
Post-sales capabilities					
Cluster mean	**0.28**	−0.27	0.27	−0.38	3.67
SD	0.58	1.09	0.49	1.28	0.01
Systems integration capabilities					
Cluster mean	0.06	**0.44**	0.11	−0.20	1.29
SD	0.89	0.55	0.92	0.86	0.28

(continued)

Table 6 Continued

	Off-the-shelf solution providers ($n=41$)	Resellers ($n=15$)	Industry specialists ($n=24$)	Technologists ($n=11$)	*F*-value (probability)
Variables that define the heterogeneity of the environment[a]					
Range of services offered					
Cluster mean	−0.12	0.36	−0.18	**0.37**	1.75
SD	0.94	0.88	1.03	0.93	0.16
Range of products offered					
Cluster mean	−0.06	−0.50 (4)	0.14	**0.57** (2)	3.04
SD	0.96	0.96	0.93	0.82	0.03
Heterogeneity in the industries served (reversed)[b]					
Cluster mean	−0.26(3)	−**0.53** (3)	0.50 (1, 2)	0.08	5.10
SD	0.90	0.83	0.98	0.90	0.01
Heterogeneity in the size of the clients (reversed)[b]					
Cluster mean	0.02	−0.29	0.29	−**0.57**	2.44
SD	0.98	0.91	0.98	0.95	0.05
Heterogeneity in the size of the projects (reversed)[b]					
Cluster mean	−**0.56** (2, 3)	0.38 (1,3,4)	0.75 (1, 4)	−0.50 (2, 3)	16.61
SD	0.66	1.02	0.84	0.79	<0.0001
Heterogeneity in the value of the projects (reversed)[b]					
Cluster mean	−**0.70** (2, 3)	0.35 (1)	0.68 (1,4)	−0.19 (3)	18.92
SD	0.52	1.08	0.93	0.50	<0.0001

[a]Cluster means represent the average values of the taxonomic variables (standardized) for the four clusters. The numbers in parentheses indicate the cluster numbers from which the focal group was significantly different at the 0.05 level, as indicated by a Scheffe test. Numbers in bold represent the highest centroid for the variable.

[b]High values of the four Herfindahl heterogeneity indices indicate low levels of environmental heterogeneity.

in the model strongly discriminate among clusters (at $P<0.05$ with a Scheffe contrast).

5.1.1 Off-the-shelf solution providers

These providers comprise the largest cluster, representing 45% of the overall sample. These firms possess primarily delivery, post-sales, and consulting capabilities, while they do limited software development or hardware manufacturing. They either sell their own standardized packages or work in partnership with larger software firms for which they commercialize and install standard products after adding the minimum level of customization required. The presence of consulting capabilities is an indication that off-the-shelf solution providers have already worked with their customers before installing the product. They assess the business needs of their customers and help them select the most appropriate IT solution available on the market. They also deliver and install the solution, which is composed of standardized products often sourced from external suppliers and assembled according to the client's specifications. As their business does not require any industry-specific competences, they serve a large number of clients in different industries. The low levels of customization of the solutions and the strong emphasis on consulting capabilities make this business model largely adopted by former consultancy companies. The big players in the IT sector, such as Accenture, IBM Global Services, the consulting division of HP, fall all within this category. They rarely develop ad-hoc modules; they usually design standardized software packages and recombine them to offer mass customized solutions.

5.1.2 Resellers

Firms in this group are small and relatively young companies characterized by specialized capabilities, mostly in finance and systems integration. They serve customers from different industries yet they focus on few typologies of products. Similar to off-the-shelf solution providers, resellers help their customers buy hardware and software from third parties, and do not produce in house; they provide assistance to improve the compatibility among legacy systems that are not fully interoperable. Yet, in contrast with off-the-shelf solution providers, they provide solutions tailored to customer needs (they have the second highest degree of customizability in their capabilities): they offer to their customers IT competencies that the latter are not able or not willing to develop.

This is the case of InfoCore, a small British firm specialized in business intelligence, whose core business is the provision of development and training for third-party products such as Oracle Discoverer or Oracle Applications. Their approach to customers is highly flexible. Although they mostly work at the client's site, they can also offer remote support to help their customers save on travel costs: an example of how to customize services to face customers needs. Another remarkable example is represented by E-Platforms, whose philosophy is well described in their

own website: 'we are not an agency that has hundreds of clients, so we can afford to get to know all our clients very well to deliver excellent results for their businesses through our approach, strategies and expert knowledge'.

5.1.3 Industry specialists

These firms focus primarily on software development and, to a lesser extent, on delivery and post-sales activities. They are relatively small and newly established companies that operate with clients in a specific industry (e.g. health care, transportation, publishing, or public administration). Although the solutions they deliver are not tailored to specific customer needs, they are highly industry-specific. This enables industry specialists to develop specific knowledge of the internal processes of their customers. In turn, this specific knowledge allows them to prepare *ad hoc* solutions for the idiosyncratic needs of the industry. Finally, as industry specialists are the only ones possessing the specific product knowledge necessary to offer adequate post-sales services for the products they developed, they may use this knowledge to lock their customers into a long-term business relationship.

The Swedish firm Cambio Healtcare Systems constitutes a case in point: the firm's core business is the development of solutions dedicated to the healthcare sector. They were the first ones to develop a platform that integrates all the services for IT support required by healthcare organizations, addressing the entire range of needs of county councils and regions. Another example is represented by Swing Digital, a provider of software and web-based applications for school communities, specifically developed to meet the requirements of teachers, students and parents.

5.1.4 Technologists

This is the smallest cluster, representing 12% of the overall sample. Technologists are former hardware manufacturers and software vendors that have moved into the IS business. They are large and well-established firms offering a wide range of customized products and services. They possess capabilities in software development and hardware manufacturing and pay little attention to delivery and post-sales activities. Similar to industry specialists, technologists focus on a restricted number of industries. Yet, in contrast to industry specialists, they occupy the upstream section of the industry value chain and delegate to other firms (e.g. resellers) the task of implementing the solution. While industry specialists sell standardized products and use their process knowledge to lock customers into their delivery and post-sales processes, technologists try to achieve the same objective by leveraging their technological skills to develop highly customized hardware and software products that cannot be easily substituted by other providers' solutions. This is the case of Verona Software, an Italian firm leader in the development of IS for hospitality, restaurant and catering businesses. The firm focuses on a niche market. It develops proprietary software and offers customized PDAs to address the needs of operators in the hospitality sector. Another example is constituted by Alvento, a Spanish firm that

provides a platform of products and services based on a proprietary technology, to manage high volumes of MMS and SMS messages. Besides offering IS, Alvento licenses its proprietary technologies to third parties, making its product development capabilities a source of competitive advantage.

It is useful to stress that all the characteristics defined above are to be intended as part of a continuum and that the specificities illustrated emerge from the identification of the clusters' centroids. In the description, we emphasized the differences across these centroids. However, a certain degree of variance is always present within each group. Therefore, even when one specific activity has not been associated with a particular cluster, we have observed some capabilities in this specific domain. The analysis simply reveals that, compared to other groups, proportionally less importance is assigned to this activity than to their core activities.

5.2 Predictive validity: performance differences among configurations

In Table 7 we report performance differences between the sample of IS providers (considered as a whole) and the control sample of generic IT firms. In Table 8 we report differences between each configuration of IS providers and the control sample of generic IT firms (for generic IT firms the comparison is restricted to firm-level variables only).

The results in Table 7 provide partial support to Hypothesis 1. Although IS providers did not display statistically significant differences in productivity with respect to generic IT firms, they are more profitable, and in the two years that

Table 7 Performance differences between IS providers and generic IT firms

	Generic IT firms ($n = 91$)	IS providers ($n = 91$)	*F*-value (probability)
Profit margin			
Mean	−0.78	12.25	16.01
SD	(22.42)	(20.77)	(<0.01)
Revenue per employee			
Mean	134.24	143.13	0.23
SD	(73.73)	(160.09)	(0.63)
Δ Profit margin			
Mean	0.12	3.04	3.36
SD	(1.89)	(12.75)	(0.07)
Δ Revenue per employee			
Mean	0.04	0.25	8.55
SD	(0.29)	(0.50)	(<0.01)

Table 8 Analysis of predictive validity: performance differences among clusters

	Off-the-shelf solution roviders ($n=41$)	Resellers ($n=15$)	Industry specialists ($n=24$)	Technologists ($n=11$)	Generic IT firms ($n=91$)	F-value (probability)
Profit margin						
Mean	0.53 (3, 5)	−0.07	−0.14	**0.75** (5)	−0.30	7.40
SD	1.10	0.46	0.15	1.16	1.00	(<0.01)
Revenue per employee						
Mean	0.13 (4)	−0.43 (4)	−0.37 (4)	**1.20** (1,2,3,5)	−0.04 (4)	6.31
SD	1.26	0.50	0.57	2.28	0.59	(<0.01)
Δ Profit margin						
Mean	0.06	0.00	−0.03	**0.86** (5)	−0.17 (4)	2.69
SD	0.68	0.22	0.21	3.49	0.19	(0.03)
Δ Revenue per employee						
Mean	0.26 (5)	**0.49** (5)	−0.21	0.39	−0.28 (1,2)	3.74
SD	1.45	0.81	0.60	1.04	0.66	(0.01)
Revenue per project						
Mean	0.02	−0.31	−0.17	**0.44**	n.a.	1.53
SD	0.81	0.33	0.81	1.74		0.21
Degree of goal achievement						
Mean	−0.19 (3)	**0.42**	0.39 (1)	−0.38	n.a.	3.58
SD	1.04	0.7	0.89	0.88		0.01
Customer satisfaction						
Mean	−0.18 (2,3)	**0.57** (1,4)	0.46 (1,4)	−0.69 (2,3)	n.a.	7.46
SD	0.94	0.72	0.71	0.95		(<0.01)

(continued)

Table 8 Continued

	Off-the-shelf solution roviders ($n=41$)	Resellers ($n=15$)	Industry specialists ($n=24$)	Technologists ($n=11$)	Generic IT firms ($n=91$)	F-value (probability)
Homogeneity						
Mean	−0.54	−0.17	**0.72** (4)	−0.02 (3)	n.a.	11.93
SD	0.79	0.86	0.82	0.88		(<0.01)
Specialization						
Mean	−0.60 (2,4)	**0.5** (1,3)	−0.34 (2,4)	0.38 (1,3)	n.a.	15.2
SD	0.5	0.69	0.69	0.8		(<0.01)
Customization						
Mean	−0.20 (4)	0.39	−0.15	**0.61** (1)	n.a.	3.05
SD	0.94	0.94	0.82	1.32		0.03
Misfit						
Mean	−0.36	0.15	**0.31**	−0.08	n.a.	3.08
SD	0.77	0.9	1.17	0.82		0.03

Notes: Cluster means represent the average values of the variables (standardized) for the four clusters and the control sample. Numbers in parentheses indicate the clusters from which the focal group was significantly different at the 0.05 level, as indicated by a Scheffe test. Numbers in bold represent the highest centroid for the variable. High values of fit variables indicate low levels of fit between environmental homogeneity and specialization.

preceded our survey they increased both their productivity and their profitability to a greater extent than the firms in the control sample. This confirms that, on average, the provision of IS is a valuable choice for companies operating in the IT sectors.

Table 8 sheds further light on the impact that the strategic choices made by IS providers have on their performance. First, the results provide evidence of predictive validity, as we found significance differences among the four configurations with respect to most of the variables used to validate clusters. The data also provide partial support for Hypothesis 2. While the four groups display significant differences in the degree of specialization of their capabilities ($F = 15.20$, with $P < 0.0001$) and in the degree of homogeneity of the external environment ($F = 11.93$, with $P < 0.0001$), they do not display equally large differences in the degree of fit between these two variables ($F = 3.05$, with $P = 0.03$). This suggests that integrated IT solutions providers select products, markets, and customers in such a way that the resulting environmental heterogeneity is aligned with the degree of specialization of their capabilities. It also indicates that firms with specialized capabilities can more easily customize their offers.

Performance differences can be also analyzed in light of Hypothesis 3. Off-the-shelf solution providers and technologists, which have the highest degrees of fit, also display the best performance in terms of profit margin, revenue per employee and revenue per project. These two groups represent different fit configurations. Off-the-shelf solution providers apply generic capabilities in a highly heterogeneous environment to sell a large volume of standardized solutions. Technologists, on the other hand, leverage specialized capabilities in a fairly homogeneous environment. This facilitates the development of highly customized solutions that can be priced at a higher level because they are not easily substitutable. It also creates economies of scale within the organization and reduces the effort required to customize the solution (hence the higher labour productivity figures). Superior revenue performance is consistent with the literature on IS. Previous studies have pointed out that the characteristic that differentiates an IS from a simple bundle of products and services is the customization of the bundle to specific customer needs (Wise and Baumgartner, 1999).

It is worth stressing that resellers have the worst productivity results (although increasing faster than other groups) but the highest project performance. Lower productivity can be explained again by the fit argument (resellers have the second lowest degree of fit), as well as by the fact that these firms focus on low-value-added activities. The choice to operate in heterogeneous environments makes it more difficult for these firms to develop highly customized loan packages for a large number of different customers and products. The nature of the work conducted by resellers also explains their higher customer satisfaction figures: they help companies finance projects developed and installed by other organizations (e.g. technologists), which are usually held responsible for the problems that eventually occur. The poor project

performance of technologists can also be explained by the high degree of customization of their products. A high level of customization usually makes the solutions more complex and more difficult to use. It also creates compatibility problems. As for technologists the provision of post-sales assistance is rare and not strategic, they are usually blamed for their inability to provide adequate help when these problems occur. They offer such services because forced by the law, but the core of their offering is the customization of the solutions.

It is also interesting to note that the configurations with low degrees of customizability in their solutions (off-the-shelf solution providers and industry specialists) are the largest groups, accounting for >70% of the firms in the sample. This suggests the emergence of a trend towards standardized solutions—which is increasingly appreciated by customers, as they are then free to change IT providers without being locked into a specific business relationship. Projects based on standardized solutions can be run on time and on budget, and with significant savings for the customer. They can generate economies of scale and scope that would be impossible to obtain when working with customized products and services.

The comparison between the performance of the four clusters of IS providers and the sample of generic IT firms suggests a final interesting remark. Generic IT firms are less profitable than every cluster of IS providers. However, their productivity is actually higher than that of the two configurations without fit (resellers and industry specialists). Therefore, even if on average the decision to become an IS provider seems to guarantee performance advantages compared to the mere sale of hardware or software (Table 7), it is clear that these advantages are far greater for the firms who are able to align their capabilities to the characteristics of the environment in which they operate.

6. Conclusions, limitations, and future research

Using primary data from 102 firms in the IT sector, this artcle sheds some light on the strategies of firms that offer IS. Our analysis identified four distinct configurations of IT providers that display fit between their organizational capabilities and their operational environment. It also indicated that IS providers that possess specialized capabilities tend to customize their offers and generate more value when they operate in homogeneous environments. The results also confirmed that the provision of IS is generally a more valuable option that the sale of pure hardware or software, and that the advantages generated are magnified by the development of appropriate capabilities that fit the firm's operational environment.

The present research makes four sets of contributions to the literature. First, this article is one of the first attempts to provide a rigorous empirical scrutiny of the IS advantage hypothesis, which has been often advocated in the literature, but mostly

supported by theoretical arguments and anecdotal evidence only. Second, the article fills a gap in the literature by providing an accurate description of the capabilities that IT firms can develop when they move into the IS business, which is quite new and still poorly understood. It also offers a detailed analysis of the actual competitive scenarios in the sector. The identification of the four strategic groups provides an empirical proof that different strategic approaches to the provision of IS can indeed coexist in the same competitive environment. The novel business model underpinning the offer of IS include a continuum of different propositions, which range form the provision of a single product with a few additional service elements (or vice versa), to the more complex case of a fully integrated, multi-product, multi-service solution that addresses all customer needs (Davies, 2004). The four different configurations we have identified can be placed along this continuum. They show differences both in the degree of alignment of their internal and external characteristics as well as in their performance. This implies that, although a certain degree of equifinality exists in this industry, the different combinations of structure and strategy are not fully equivalent. The results also indicate that it is difficult to identify a silver bullet approach to the provision of integrated IT solutions, because different strategies are best suited to achieve different performance objectives. This offers room for strategic manouvering to IS providers, who can develop different capabilities or target different markets, or both, depending on the specific objectives they aim to pursue.

A forward-looking interpretation of the results provides a related contribution to this literature and sheds some light on the industry dynamics. The analysis suggests that, consistent with the hypothesis that in industries approaching the maturity phase of their technology life cycle firms tend to place greater emphasis on volume and cost efficiency (Abernathy and Utterback, 1978), it is emerging a trend toward the standardization of the back-end components of IS. When the business model of IS was first developed in the IT sector, firms tended to achieve high levels of the customization both in the product and in the service components of the solution. However, such a high degree of software customization created problems in the compatibility of the solution, and made post-sales services and assistance more difficult and expensive. As the cost of such activities raised, solutions providers started to increase the standardization of software and hardware components, limiting the customization of the solution to its 'front-end' component (Lee and Tang, 1997; Davies and Hobday, 2005). As IT systems are becoming commoditized and no longer guarantee competitive advantage to their users, companies with simple IT needs prefer standardized software that does not lock them into exclusive relationships with their suppliers. The IT practitioners interviewed for this project agree that the emergence of standardized solutions will segment the market even further. A growing number of firms with simple IT needs will opt for the standardized solutions provided by off-the-shelf solution providers and industry specialists. These providers will most likely increase their market share. Conversely,

more complex requirements will still be addressed by technologists, but the need for this type of service will become rarer and will cause a decrease in the market share of these firms.

A second set of contributions concerns the literature on contingency theory and the resource-based view. Our study clarifies the nature of the capabilities for the provision of integrated IT solutions and it demonstrates that these theories are useful theoretical lenses to analyze this phenomenon. Moreover, the analysis reinforces the concept of 'sticky' core capabilities: the differences among configurations suggest that firms are constrained in their strategic choices by the pool of capabilities they possess. The results improve our understanding of the concept of fit and shed light on its applications and its limitations in the context of integrated IT solutions

A third set of contributions concerns IT practitioners and consultants who operate in the business of IS. The identification of alternative strategies to IS, the analysis of performance differences, and the identification of future market trends offer useful insights. Managers and practitioners can use our results to verify whether the strategies implemented are consistent with the capabilities of their organizations. They can also use them to decide whether a shift in strategy is needed and how to manage this change coherently, given their internal resources.

As every empirical work, our analysis is not exempt from some limitations, which naturally suggest several avenues for future research. First, our work is mostly exploratory: it is a first attempt to build a theory in the field of integrated IT solutions. Second, the analysis is based on a small sample and included some self-assessed measures of operational performance. Follow-up empirical studies are therefore called for to confirm our hypotheses. These should be extended to different industry sectors, possibly relying on a larger sample and using objective measures of project performance. Finally, another consequence of our data-gathering approach is that while the analysis provides a very good static picture of the firms studied, it offers limited information about their evolution over time. It would be therefore interesting to replicate this analysis in the near future to assess whether the hypothesized market changes have actually occurred.

Another important direction for further research is represented by the long debated standardization vs. customization dilemma. In this work we have suggested that these two characteristics of a solution are two facets of the same coin, i.e. they represent two extremes of a single dimension along which firms optimize their offer. The assumption underlying this perspective is that firms can deliberately decide the optimal degree of customization the want to apply to their offers. Clearly, resource scarcity, organizational characteristics and other exogenous contingencies may constrain this decision and force firms to make sub-optimal choices. Future research may shed further light on this issue, looking at the specific firms characteristics that may facilitate or hamper one characteristics in favor of the other.

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Appendix A

Table A1 The survey

Firm and project characteristics	Min	Max	Mean (SD)
Firm size (no. of employees)	13	75,000	1331.67 (7671.53)
Average project size (months)	6	48	17.49 (12.99)
Average project value (k €)	25	5000	752.68 (1260.77)
Revenue per employee (k €)	0.18	1428.57	152.99 (221.82)
Revenue per project (k €)	1.43	25 000.00	668.18 (3014.92)
Profit margin (%)	12.25	20.76	−9.44 (63.13)
Level of customer satisfaction (1 = excellent; ... 3 = average; ... 5 = poor)	1	5	1.87 (0.71)

Please indicate your revenue breakdown (in %) by:

Industry sector	Min	Max	Mean (SD)		Min	Max	Mean (SD)
				Client size			
Agriculture	0	60	11.50 (18.04)	<99 employees	0	100	47.39 (33.54)
Health	1	100	26.89 (35.09)	100–499 employees	0	100	36.00 (26.96)
IT	2	100	29.00 (27.71)	>500 employees	2	100	64.93 (32.75)
Finance	5	100	25.36 (23.20)	*Project length*			
Manufacturing	3	100	32.19 (29.73)	<1 year	0	100	64.02 (30.91)
Construction	0	100	24.64 (35.68)	1–2 years	0	100	31.12 (20.78)
Professional services	0	100	23.96 (24.68)	>2 years	2	100	38.98 (33.39)

(continued)

Table A1 Continued
Please indicate your revenue breakdown (in %) by:

Industry sector	Min	Max	Mean (SD)		Min	Max	Mean (SD)
Transportation	3	100	15.67 (22.10)	*Project value*			
Public administration	1	100	26.81 (22.32)	<50 k €	0	100	48.56 (33.79)
Wholesale, retail	1	100	24.64 (23.41)	50–100 k €	0	100	30.61 (21.31)
Educational	1	90	17.07 (22.51)	100–500 k €	0	100	29.11 (22.01)
Entertainment, tourism	3	80	22.67 (26.77)	500–1000 k €	0	100	22.05 (17.47)
Other	3	13	9.00 (4.24)	>1000 k €	4	100	36.85 (31.87)

Please describe the characteristics of your business by agreeing/disagreeing with the statements below (1 = Strongly agree; 2 = agree; 3 = indifferent; 4 = disagree; 5 = strongly disagree)

This activity is a key activity in our business	Min	Max	Mean (SD)	This activity is usually performed in every project	Min	Max	Mean (SD)
Post-sales	1	4	1.56 (0.81)	Post-sales	1	4	1.73 (0.92)
Consulting	1	4	1.51 (0.84)	Consulting	1	5	1.94 (1.04)
Systems integration	1	4	1.54 (0.75)	Systems integration	1	5	2.21 (1.08)
Software development	1	4	1.51 (0.77)	Software development	1	5	2.01 (1.09)
Financial	1	4	2.31 (1.08)	Financial	1	5	2.25 (1.13)
Hardware and infrastruct. mfg.	1	5	2.79 (1.63)	Hardware and infrastructure mfg.	1	4	2.14 (1.03)
Delivery	1	5	1.71 (0.88)	Delivery	1	5	1.87 (1.01)

(continued)

Table A1 Continued

Please describe the characteristics of your business by agreeing/disagreeing with the statements below (1 = Strongly agree; 2 = agree; 3 = indifferent; 4 = disagree; 5 = strongly disagree)

This activity is a key activity in our business	Min	Max	Mean (SD)	This activity is usually performed in every project	Min	Max	Mean (SD)
This activity has been heavily customized around customer specific needs							
	Min	Max	Mean (SD)				
Post-sales	1	5	1.89 (0.92)				
Consulting	1	5	1.77 (1.01)				
Systems integration	1	4	1.53 (0.67)				
Software development	1	4	1.63 (0.81)				
Financial	1	5	2.19 (1.17)				
Hardware and infrastruct. mfg.	1	5	2.57 (1.60)				
Delivery	1	5	1.92 (0.91)				
Please indicate whether external suppliers are involved in the provision of the following activities (1 = Yes; 2 = No)							
Post-sales					1	2	1.57 (0.50)
Consulting					1	2	1.70 (0.46)
Systems integration					1	2	1.60 (0.49)
Software development					1	2	1.78 (0.42)
Financial					1	2	1.44 (0.51)
Hardware and infrastructure Mfg.					1	2	1.21 (0.43)
Delivery					1	2	1.66 (0.48)

(continued)

Table A1 Continued

Please describe the characteristics of your business by agreeing/disagreeing with the statements below (1 = Strongly agree; 2 = agree; 3 = indifferent; 4 = disagree; 5 = strongly disagree)

This activity is a key activity in our business	Min	Max	Mean (SD)	This activity is usually performed in every project	Min	Max	Mean (SD)
Please indicate the percentage of work done internally for each of the following activities (0 = none; 1 = ≤20%; 2 = 21%–40%; 3 = 41%–60%; 4 = 61%–80%; 5 = 81%–100%)							
Post-sales					1	5	3.41 (1.16)
Consulting					1	5	3.00 (1.26)
Systems integration					0	5	3.11 (1.28)
Software development					0	5	2.63 (1.75)
Financial					0	4	1.00 (1.32)
Hardware and infrastructure mfg.					0	5	1.91 (1.76)
Delivery					0	5	3.25 (1.48)

Please indicate the types of services and products offered by your company (3 = included and managed in-house; 2 = included and managed both in-house and externally; 1 = included but managed by external providers only; 0 = not included)

	Min	Max	Mean (SD)		Min	Max	Mean (SD)
Integration of products and services	1	3	2.72 (0.51)	Software development	0	3	2.49 (0.85)
Integration of different technologies	0	3	2.53 (0.86)	Software customization	0	3	2.67 (0.68)

(continued)

Table A1 Continued

Please indicate the types of services and products offered by your company (3 = included and managed in-house; 2 = included and managed both in-house and externally; 1 = included but managed by external providers only; 0 = not included)

	Min	Max	Mean (SD)		Min	Max	Mean (SD)
Business consulting	0	3	1.82 (1.40)	Software support	0	3	2.60 (0.84)
Technology consulting	0	3	2.45 (0.96)	Training of users	0	3	2.51 (0.93)
Financial services	0	3	0.65 (1.07)	Hardware mfg.	0	3	0.46 (0.84)
Infrastructure mfg. and installation	0	3	0.79 (1.06)	Hardware maintenance	0	3	1.03 (1.17)
Hardware delivery and installation	0	3	1.25 (1.26)				