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## Strategic adjustment between innovation and production: Generation of integrated archetypes in Spanish service firms

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# Working Paper Series

## Strategic Adjustment Between Innovation and Production: Generation of Integrated Archetypes in Spanish Service Firms

Dioni Elche Hortelano  
Ángela González Moreno

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# **STRATEGIC ADJUSTMENT BETWEEN INNOVATION AND PRODUCTION: GENERATION OF INTEGRATED ARCHETYPES IN SPANISH SERVICE FIRMS**

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# **STRATEGIC ADJUSTMENT BETWEEN INNOVATION AND PRODUCTION: GENERATION OF INTEGRATED ARCHETYPES IN SPANISH SERVICE FIRMS**

## **Abstract:**

*This paper investigates empirically the strategic alignment between innovation and production strategies in a sample of service firms in Spain. It employs the integrated archetypes approach to analyse a dataset of unique, manually collected, firm responses. The results highlight differences in behaviour patterns underpinning both kinds of strategic decisions and, coherent with alignment theory, differential firm performance.*

## **1. Introduction**

The objective of this paper is to investigate empirically the strategic alignment between innovation and production strategies in a sample of service firms in Spain. The theory of strategic alignment argues that the interaction between two or more dimensions of the organization of a firm produces synergic effects if these are consistent with each other. Consistency implies that the adoption of coordinated strategies, as opposed to merely co-existing, produces better performance for a firm. The literature reveals an association between innovation and production strategies (Lundvall, Johnson, Andersen, Dalum, 2002).

The analysis is framed in the empirical context of service innovation, which has become an established field of investigation in recent years (see e.g. Miles, 1996; Sundbo and Gallouj, 2000; Sundbo 2002; Miles, 2004). Over the past thirty years service activities have contributed significantly to economic growth under many counts. Service sectors absorb about 70% of labour force and account for a large share of total value added across developed economies (OECD, 2005). This is also the case in Spain, where service sectors account for 67.2% of total value added and 65% of industrial employment. At the same time, service activities play an important strategic role by encouraging cross-sectoral interactions (Bhagwati, 1987; González, 1997; Cuadrado, 1999). Due to their intrinsic dynamism some service activities are central to the development and the diffusion of innovation (Tether and Metcalfe, 2003). Business services, in particular, emerge as key drivers across knowledge-based economies due to

their intermediary function (den Hertog, 2000; Freels, 2006; Miles, 2005).

According to the strategic alignment idea some decisions about innovation are more suitable with respect to specific production decisions. In the context of service firms, for example, this is observed concretely when consumers' involvement influences their innovation behaviour (Tether, Hipp and Miles, 2001). Consistency among such decisions generates strategic configurations that are instrumental for the achievement of improved performance. The normative implication of this methodology is that adjusted patterns thus defined facilitate the identification of best practices in firms, and of the strategic profiles that are associated with higher efficiency levels. The research question that is addressed by this paper is: which patterns of adjustment exist between these two dimensions? We investigate this by identifying differences between adjusted and non-adjusted patterns of integrated decisions in our sample of Spanish firms.

The paper is structured as follows. Section two provides a brief outline of the theoretical background of strategic alignment from the perspective of integrated archetypes. Here we also describe the dimensions implied in this strategic fit: the productive strategy focused on service firms, and innovation strategy. Section 3 presents an empirical analysis on the existence of strategic adjustment in a sample of services firms in Spain. Conclusions summarise the main results.

## **2. Theoretical Considerations**

This section is structured in two parts. The first introduces the theory underpinning strategic adjustment while the following subsection presents the two dimensions that are used for our analysis of innovation in the service sector.

### *2.1 Strategic alignment*

The theory of strategic alignment focuses on the creation of synergies across different organizational dimensions through the adoption consistent decisions. Consistency implies that the development of coordinated, as opposed to merely co-existing, strategies produces better performance in a firm (Venkatraman, 1990). Implicit in this view is the idea that strategy is defined by patterns of interactions across several firm

dimensions (Venkatraman and Camillus, 1984).

The notion of alignment – or fit – is important in the field of Strategic Management because it relates firm strategy with the adjustment of its internal resources and capabilities with respect to changing goals. Its relevance is two-fold. On the one hand, the descriptive aspect of alignment highlights the existence of structured relationships across organizational variables. On the other hand, its normative side indicates the connection between adjustment and performance. This prescriptive focus indicates the strategic behaviour that firms should adopt to improve their efficiency level.

According to Venkatraman (1990) the notion of internal consistency extends to various areas of operations and functions within a firm. Strategic alignment is traditionally used to analyse the adjustment between internal and external dimensions of the firm. Several works look at the coherence between organizational decisions and the environment in which firms operate; others focus on the compatibility between the organizational structure and the environment. As the majority of such studies include external variables in the analysis of adjustment, they contributed to the diffusion of the Contingency Theory (Venkatraman, 1989). This paper proposes an approach to alignment based on the analysis of strategic adjustment between two internal dimensions: innovation and production strategies.

Venkatraman and Camillus (1984) identify six approaches to strategic adjustment based on two dimensions: “domain of fit” (external, internal and integrated) and “fit concept” (content and process). Subsequently Venkatraman (1989) added a third dimension to this scheme, “representation-conceptualisation of fit”. Following this, studies on alignment include either a univariate or a multivariate perspective. With regard to the above classification, this paper falls into those that are focused on the internal domain with a concept of alignment based on content of the firm. Accordingly, organizational strategy is understood as a system of adjusted elements, or as a consistent allocation of resources allowing a firm the achievement of its objectives (Grant and King, 1982). This notion is relevant to the empirical focus of this paper. As innovation and production strategies in service firms involve multiple variables for a complete

specification we adopt a multivariate approach<sup>3</sup>: adjustment perspective as an integrated archetype.

## *2.2 Innovation and production strategies*

Innovation is considered a strategic variable in firms due to its influence on performance. Innovative activity is a key factor to organisational success because it is the most important source of sustainable competitive advantage.

Current thinking in Strategic Management theory draws on the Resource-Based view of the firm and emphasises the dynamic and endogenous character of innovation (Teece, Pisano and Shuen, 1997; Helfat and Peteraf, 2003). In this perspective the mission of a firm is defined by the alignment of internal resources with the objectives. Over time this relationship is likely to change due to a variety of factors such as obsolescence, newly available inputs, or the effects of the competitive process. As a consequence of such a mismatch firms need to implement changes which are facilitated by higher-level competences, or capabilities. The scope of capabilities is broader than the day-to-day running of a firm, and reflects a learned ability to cope with dynamic and unstable competitive environments (Teece and Pisano, 1994; Winter, 2003). The development and application of capabilities involves the organization of tangible or intangible resources to achieve and sustain competitive advantage. In this approach innovation is considered as an integral part of a firm's strategy.

Early literature on innovation is characterised by a marked technicist bias, that is, a stronger focus on 'hard' technologies, especially in the context of manufacturing sectors. However, this seems not appropriate to service firms where innovation is often tied to organizational or strategic inputs (Sundbo, 1997), the 'soft' side of innovation according to Tether and Metcalfe (2003). The emphasis on the intangible nature of service activities is also manifest in relation to their output. As Sundbo and Gallouj (2000) argue, innovation in services does not develop only along a technological trajectory but also involves a professional trajectory where technology is only one

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<sup>3</sup> In Venkatraman' (1989) work, two alternative modes of concept and representation multivariates are pointed out: adjustment as deviation to ideal profile and covariation pattern.



contributing factor together with others. Very often this process relies on the creation of new knowledge which is instrumental to the generation and exchange of information. Service innovation therefore thrives on the emergence of new models for the management of tangible and intangible resources, as well as appropriate internal channels that foster new behaviours and relations within employees (Sundbo and Gallouj, 2000). This is closer to Schumpeter's (1934) broad vision of innovation and, in relation to service firms, has been recently advocated by Drejer (2004).

This paper takes a wide view of innovation in services, to include all the steps involved in the process as opposed to studies that only incorporate either input or output as measure of innovation. It focuses on efficient management of innovation and, more specifically, on the development and incorporation of innovation, as well as on the practices that facilitate its exploitation and protection. Moreover, the paper considers the attitude towards innovation as a specific, rather than implicit, objective which each firm sets out to achieve.

The relationship between innovation and production strategies is highly relevant in the context of services. Various studies confirm this by showing that the adoption of specific production strategies – defined by the degree of customisation – implies different innovation patterns in service firms (Tether et al., 2001; Elche and González, 2007). Sundbo and Gallouj (1998) classify service activities according to the degree standardisation or customisation of the output, and to the intensity of use of technology in the production process. This way they identify the impact of social and technological changes on the innovative behaviour of service firms. Following on this, we define production strategy according to two critical dimensions, namely use of technology (input) and degree of customisation (output). On the one hand, the adoption of new technologies is considered as a determinant factor for the ability to innovate; on the other hand, the degree of interaction between producers and customers in service firms bears direct influence on innovation. In this sense the intangible nature of services can facilitate output customisation depending on the degree of direct participation by, or co-production with, consumers.

Services present special characteristics due to their non-physical character: they are intangible, simultaneous, perishable and heterogeneous (Miles, 1996). Contrary to early

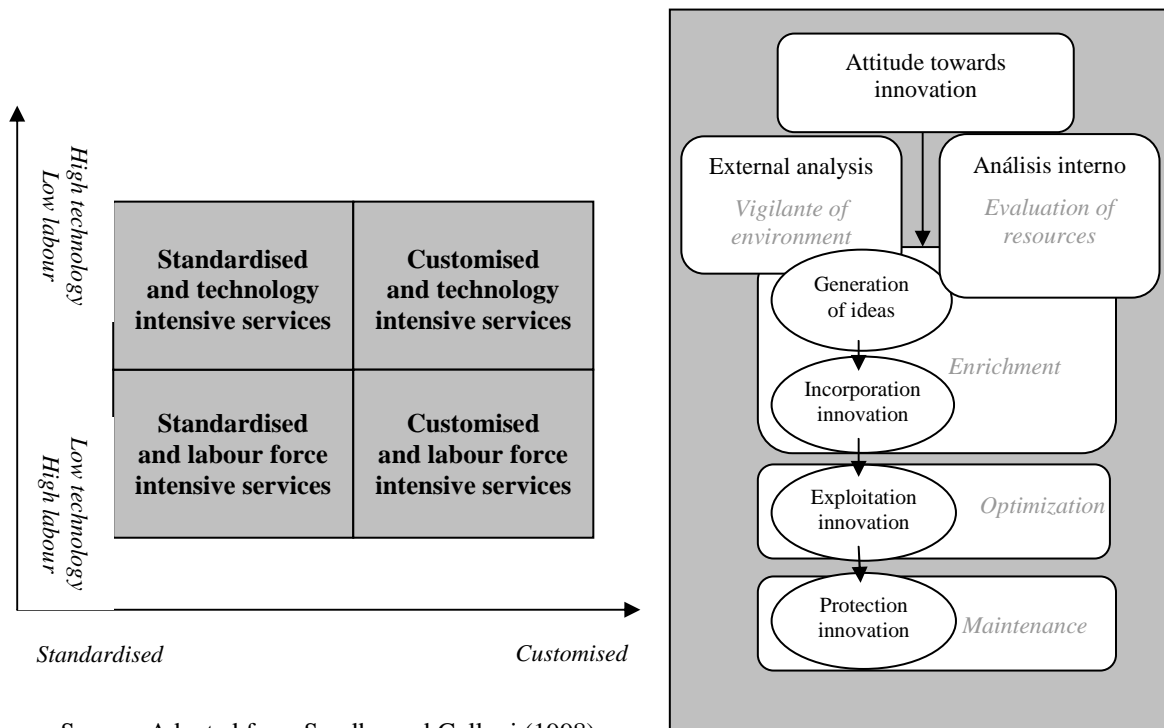
studies suggest, the service industry is rather heterogeneous in that it embraces numerous and very diverse activities. Service firms can develop rather different productive strategies and this diversity is manifest also across firms which operate in similar areas of activity. This means that belonging to a specific sector does not determine univocally the productive strategy. Sectoral studies on innovation assume the opposite, that all firms adopt the same strategic behaviour and, that, therefore their productive strategies can be generalised to the whole sector. However this deterministic view should be taken with caution because it subordinates firms' strategies to the sectoral structure. Empirical evidence instead shows that strategic decisions depend on a wide set of variables, and that the sectoral dimension is but one among them. Similarly, recent literature on service innovation proposes alternative categories (Hollenstein, 2003; Salter and Tether, 2006; Dalziel, 2007) that are not based on conventional sectoral classifications. Salter and Tether (2006) suggest three categories: traditional services, systems firms and knowledge intensive and professional service firms, thus highlighting diversity within and between services and its implications on innovation patterns. Coherent with the arguments presented in this literature and with Sundbo and Gallouj (1998), we refer to production strategy in service firms as a set of decisions concerning the degree of standardisation or customisation of services, and the intensity of use of technology in the production process<sup>4</sup>.

The objective of this paper is to individuate the association between the two dimensions, innovation and production, as well as the effects of different strategic configurations on firm performance. The analysis presented here articulates the types of behaviour patterns observed in service firms, and, subsequently, investigates whether significant differences exist between adjusted and non-adjusted patterns adopted by firms with diverse efficiency levels. The normative focus of strategic adjustment facilitates the individuation of firms' best practices by connecting adjusted patterns to better performance. Therefore this approach suggests which patterns can be associated with higher firm performance.

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<sup>4</sup> In previous studies we observed that differences in output generated by service firms do not feature direct correspondence with the sector and therefore operating in a specific sector does not determine univocally the productive strategy (Elche and González, 2007).

Figure 1. Production and innovation strategies



Source: Adapted from Sundbo and Gallouj (1998)

Source: Own elaboration

Figure 1 shows the dimensions that define production (left-hand side) and innovation (right-hand side) strategies. The former builds on the work by Sundbo and Gallouj (1998) and features the degree of output customisation on the horizontal axis, and intensity of technology use in the production process on the vertical one. Their combination produces four possible outcomes as presented in the Figure. Conversely innovation strategy involves various stages including attitude towards innovation, generation of novel ideas, incorporation, exploitation and protection of innovation. This structure of innovation measure includes the strategic analysis and enrichment organization as well as optimization and maintenance of innovation.

The next section presents an empirical analysis framed in this conceptual background, and seeks to demonstrate the existence of strategic adjustment between production and innovation decisions in a sample of service firms in Spain.

### 3. Design of Investigation

This section begins by presenting background information on the service sector in Spain and, subsequently, the empirical analysis is introduced which is structured in three parts. The first two contain the description of the sample and the structure of the questionnaire. The last subsection provides details on the statistical analysis employed to test the existence of strategic adjustment in the sample of service firms.

Over the last three decades services have become a strategic sector for the Spanish economy similar to the wider European context. Their remarkable growth together with their increasing relevance is confirmed by data on value added (67.2%) and employment (65%) from the National Institute of Statistics of Spain (INE: Instituto Nacional de Estadística de España, 2005). A closer look at the composition of service activities in Spain reveals that wholesale and retail trade have the highest relative importance with respectively 61.7% of value added and 39% of labour force absorption. Other subsectors follow with significant differences, namely: Real Estate (8.7%), Business Services (7.7%), Transport (7.7%), Tourism (6.4%), and ICT (5.9%). Interestingly personal services only account for 0.4% of sectoral value added. The picture concerning the relative employment shares is rather different whereby Trade service is followed by Business Services (21.3%), Tourism (14.7%), Transport (10.6%), Real Estate (4.7%), ICT (5.9%), and Personal Services (2.5%) of labour force.

### *3.1 Sample and data collection*

The unit of analysis for this study is the firm, as an individual and independent entity of decision-making. We looked at Spanish firms operating in the service industry<sup>5</sup>, and selected those with more than 10 employees (67,710 firms). From these we extracted a random sample of 2,031 firms which were identified by two databases, Camerdata<sup>6</sup> and SABI<sup>7</sup>.

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<sup>5</sup> The analysis of the Spanish service sector is based on the NACE classification: 50, 51, 52, 55, 60, 61, 62, 63, 64, 66, 67, 70, 71, 73, 74, 85, 92, 93, and 95.

<sup>6</sup> Camerdata is a company that provides current information on the Chamber of Commerce, Industry and Shipping of Spain.

<sup>7</sup> SABI is a database of financial analyses of Spanish and Portuguese companies. This database obtains its information from the Mercantile Registration.

Information was collected through a postal questionnaire<sup>8</sup> which produced 167 valid questionnaires with an answer rate of 8.2%. Since the latter was low we checked for the non-existence of non-answer bias by comparing firms that responded quickly (20%) with those that answered later (20%). This was based on the assimilation of late respondents to non-respondents on the basis of t-test across mean differences (Armstrong and Overton, 1977). The results show that no significant differences between groups of variables.

The distribution of the final sample is presented in table 1 which shows the main activity of firms according to NACE classification and firm size measured by number of employees.

*Table 1. Description of sample*

<i>Industry</i>	NACE	% population	% sample
Trade and repair of motor-vehicles	50	46.1	37.7
Wholesale trade	51		
Retail trade	52		
Hotels and restaurants	55		
Transport	60, 61, 62	11.8	21.6
Supporting and auxiliary transport activities and activities of travel agencies	63		
Post activities	64.1		
Telecommunications services	64.2		
Financial services: banking, insurance, active. Support for financial intermediation	66, 67	30.6	32.9
Real estate activities	70		
Machinery and equipment rental	71		
Other business activities	74		
Research and development	73	11.5	7.8
Health and social work	85		
Other community, social and personal service activities	92 and 93		
<i>Size: number of employees<sup>9</sup></i>			

<sup>8</sup> The survey was sent to managers. Since this person is directly involved in decision-making for the organisation, as well as in strategy formulation and development of company politics, he or she was considered the most appropriate person to answer the questionnaire.

<sup>9</sup> The sample used in this investigation included a large proportion of companies with a high dimension in comparison with the population.

10-19	56.5	27.0
20-49	29.3	30.2
50-99	7.3	12.6
100-199	3.8	12.0
200-499	2.1	3.1
500 or more	1.0	15.1
Descriptive statistics : Min=10; Max=28,150; Mean=559.32; Median=39; Mode=20; Dt= 2,488.86		

In the table above it is possible to observe that the distribution of firms in the sample was broadly similar to that of the population, though in general knowledge-intensive business services (KIBS) were more responsive than personal services. We attribute this to the nature of management of service firms, which possesses more specific and superior qualifications and are more involved in research processes.

An observation of the descriptive statistics indicates that Spanish service firms are small-sized. In fact, while the average number of employees is 559, the sample features a rather high dispersion (2,488). For this reason the mode (20) or the median (39) values are more suitable measures of firm size.

### *3.2 The questionnaire, measurement scales and constructs*

The survey contained some open questions that sought general information about the firm. However, most of the questions were closed with multiple choice answers, using a Likert scale of seven points according to Cox (1980). The questionnaire included specific questions on the main subjects of production and innovation strategies; there were also some questions on firm performance.

Production strategy was defined by two dimensions following Sundbo and Gallouj (1998). First, we defined a measurement of the degree of customisation or standardisation as compared to competitors, using a scale Likert of seven points. Subsequently, we weighted the relative importance of production factors through the degree of technological intensity measured by three scales adapted from Huerta and Lazarra (2001).

The main source for measuring the innovation activity carried out by the companies was the Oslo Manual (1997). The scales used allowed to measure different dimensions of innovation strategy which are important for this analysis: the firm's attitude towards innovation (10 items), generation of ideas (16 items), incorporation of innovations (12 items), the system used to exploit innovations (8 items) and the method utilised to protect innovations generated (7 items). Variables relative to the nature of innovation are also included to assess the technological and non-technological character of innovation (6 items). The details of each dimension, the definition of each item and their scales of measurement are presented in the appendix.

The validation of scales was checked in accordance with Hair, Anderson, Tatham and Black (1995). Then we examined their underlying dimensions, through a factor analysis which revealed the number of factors that define each concept and the load of each variable in the factor. In each analysis we confirmed the unique dimension of constructs generated, since all items showed factorial loads superior to 0.5 and the variance was explained with a factor that was superior to 50%.

After identifying underlying dimensions in each group of variables, we carried out the study of reliability which showed the degree of internal consistency among the variables that configure the scale. This represents the degree to which the indicator of the scale measures the concept. Cronbach's Alpha test presented values above 0.7 in all constructs, indicating an appropriate level of reliability (Nunnally, 1978) (see table 2).

*Table 2. Reliability of scales*

	No. items	Cronbach Alfa
Personalisation	1	-
Technological intensity	3	0.746
Pro-activity	9	0.893
Internal ideas	6	0.808
Competitive core ideas	5	0.733
Ideas from institutions	5	0.911
Internal incorporation	4	0.764
External incorporation	2	0.722

Cooperative incorporation	6	0.793
Internal exploitation	2	0.838
External exploitation	5	0.829
Cooperative exploitation	1	-
Formal protection	2	0.911
Informal protection	5	0.788
Innovation result	6	0.782
Firm performance	10	0.919

Once the constructs were validated, they were later used in statistical analyses in place of the original variables. Subsequently, we exposed the relative questions to statistical treatments carried out using the data.

### *3.3 Alignment as integrated archetype: statistical analysis*

The concept of integrated archetype was first proposed in the literature on strategic alignment to demonstrate how fit across different organisational dimensions bears important effects on firm performance (Miller, 1998; Venkatraman and Prescott, 1990; Zajac et al., 2000). An integrated or strategic archetype can be defined as a set of firms with similar configurations of multiple attributes. This methodological approach seeks to define empirically different configurations based on several dimensions which show a theoretical relationship. The arguments in support of alignment notion point out that the concurrent alignment of numerous attributes is more predictive of firm performance. In this sense the strategic archetype approach uses the holistic view of alignment (Soh, 2002).

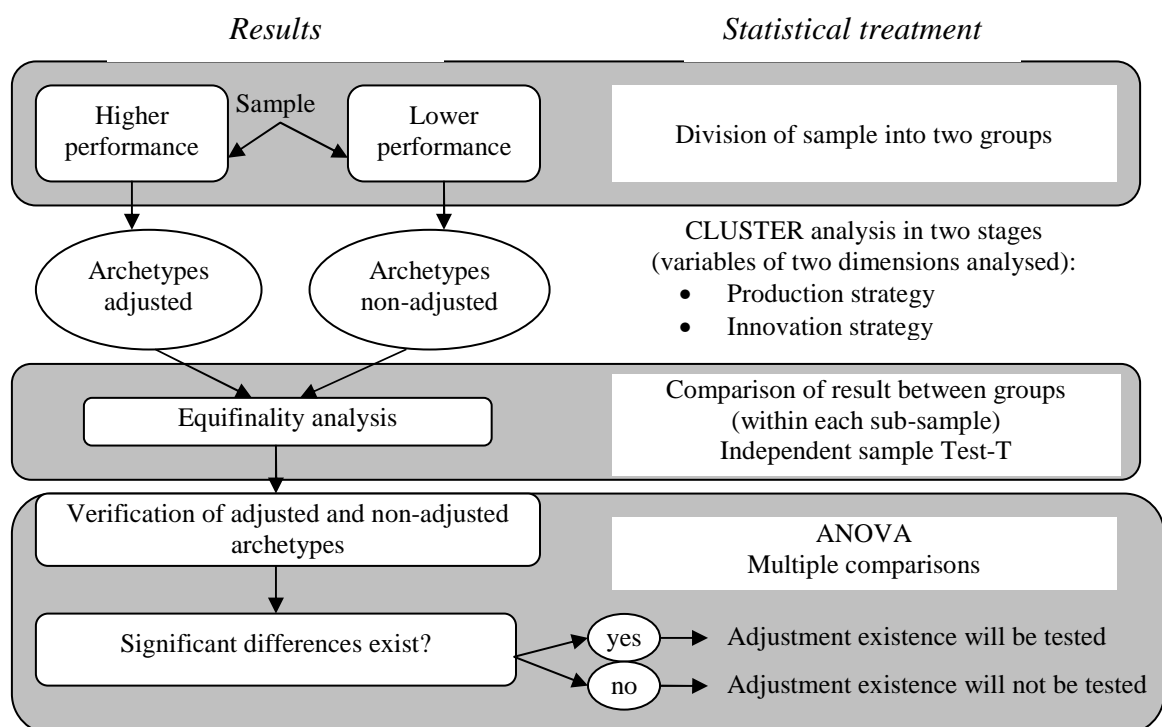
After an exploratory analysis of data and the corroboration of scales we carried out several statistical analyses to check the existence of adjustment between two dimensions analysed in service firms, those being production and innovation strategies. Consistent with the arguments above, the concept of adjustment applied in this study was that of integrated archetype. This adjustment perspective is multidimensional and is based on the generation of profiles which represent a group of relationships in temporary balance (Miller and Friesen, 1978). The determination of patterns will provide information



about equally efficient configurations. The advantage of this approach is that it allows to observe how different organisational decisions work together and, also, to pinpoint coherent combinations of strategic attributes which lead to better performance.

The methodology consists in establishing groups which combine both production and innovation strategies by using performance as a reference to group firms.

*Figure 2. Statistical analyses to confirm the adjustment*



To this end we divided the sample into two groups according to higher performance or lower performance using the median value as a threshold. After that we carried out a cluster analysis in each group of firms in accordance with the two stages method (Punj and Stewart, 1983) by using the most representative variables of both dimensions<sup>10</sup>.

<sup>10</sup> This method was used by Hambrick (1983) in an exploratory analysis of adjustment patterns in two samples (success and failure) of companies.

The data treatment stage seeks to identify behaviour patterns of more and less efficient firms and, hence, to detect differences among them. Therefore, after grouping the firms in two sub-samples, we carried out a variance analysis (ANOVA) on multiple comparisons between groups to check for significant differences between patterns. The existence of differences between adjusted and non-adjusted behaviour patterns revealed that there is internal consistency in decisions made by service firms; these consistent configurations imply the existence of strategic adjustment. Figure 2 summarises the statistical treatments used in this study.

#### 4. Results: Adjusted and Non-Adjusted Integrated Archetypes

The first step of this analysis is to test for existence of adjustment between innovation and production strategies. To this end we divide firms into two groups on the basis of the median performance value, which allows to account for the impact of adjustment on firm performance. The two integrated archetypes resulting from this exercise show different configurations of strategic decisions. One of them includes higher performance firms, which make organisational decisions with internal consistency, showing adjusted patterns of innovation and production strategies (firm performance higher than 3.18). The other archetype contains lower performance firms, in whose case strategic decisions are inconsistent, therefore presenting non-adjusted configurations between both types of strategic decisions (firm performance lower than 3.18).

Once the sample was divided, we carried out a cluster analysis in each group of firms. The results of the cluster analysis with higher performance firms is shown in table 3, while the results of the cluster analysis with lower performance firms is presented in table 4.

*Table 3. Integrated archetypes: Adjusted patterns*

<i>Construct</i>	<i>Archetype 1 (40)</i>	<i>Archetype 2 (20)</i>	<i>F/t</i>
Orientation towards personalisation	1.60	6.03	154.401*
Technological intensity	6.10	5.70	2.625
Pro-activity	5.62	4.68	11.035*
Internal ideas	5.17	4.78	1.806

Competitive core ideas	4.89	4.42	2.339
Ideas from institutions	3.92	2.70	10.211*
Internal incorporation	3.63	4.90	5.045*
External incorporation	3.95	2.18	18.246*
Cooperative incorporation	2.43	2.10	1.285
Internal exploitation	6.15	6.33	0.273
External exploitation	2.25	1.76	2.059
Cooperative exploitation	4.00	2.00	16.331*
Formal protection	2.98	1.25	15.067*
Informal protection	4.88	4.79	0.062
Firm performance	3.98	3.89	0.497 (test-T)

\* significant at 0.99

The cluster analysis carried out with higher performance firms provided two archetypes: adjusted pattern 1 which contains 40 firms and non-adjusted pattern 2 with 20 firms. These firms belong to the group of higher performance firms, implying that the patterns obtained are adjusted for both of them; that is to say that there is internal consistency with regard to strategic decisions. Thus, the description of these patterns indicates combinations of decisions about production and innovation which are more conducive to the achievement of superior performance.

- Adjusted pattern 1: The firms in this group develop a production strategy based on the standardisation of services (1.60). These productive processes depend on high technology intensity (6.10). Relative to innovation they show a very proactive attitude. These firms place a good deal of importance on being at the forefront and being a pioneer in the introduction of innovations. They tap on multiple sources for innovative ideas which originate both internally (5.17) and externally (competitive core (4.89) and institution (3.92)). As well they combine several modes to incorporate innovations such as internal, external and cooperative methods. They also exploit their innovations in cooperative (4.00) and internal (6.15) systems. Relative to the system of protection of generated knowledge, these firms use both formal methods (2.98) (based on the legal system) and informal methods (4.88), but in relation to other archetypes they are notable for using more industrial and intellectual property systems to protect

property from imitators. This archetype is quite similar to “systems firms” in the classification of Salter and Tether (2006), which tend to be more standardised because the logic of standardisation is necessary to create a systemic configuration of the firm. Also systems firms employ high level technology, where ICTs play a central role. Furthermore, they demonstrate their pro-activity in a wide range of connections to universities, suppliers and customers, and methodically incorporate, exploit and protect innovation which can configure a distributed and collected system of innovation.

- Adjusted pattern 2: These firms develop a production strategy centred on customisation (6.03), as well as the use of technology (5.70) in the production process (though it is less important here than in the other adjusted archetype). Principle innovation ideas have diverse origins, both internal (4.78) from the organisation and external from their competitive environments (4.42) (clients, suppliers and competitors). Innovation strategy focuses on internal methods of incorporation (4.90) and exploitation (6.33) because they seek to take advantage of their resources and capabilities. With regard to protection mechanisms, they opt for informal (4.79) protection based on organisational strategies, like secret or complex innovation, in order to keep their knowledge within the organisation. These firms are rather similar to “professional services” which is a category in knowledge intensive services, according to Salter and Tether’s classification. They develop a fairly customised strategy which allows for ad hoc solution of specific problems because very often they must deal with unique clients in very specific contexts. These firms innovate by seeking to exploit existing know-how, in order to involve internal knowledge in innovative activities.

These two archetypes obtained from superior performance firms reveal different combinations of production and innovation decisions (table 4 shows the value of the F test and its significance, which indicates the differences between both archetypes). In addition, we assess the equifinality of configurations, showing that no significant differences exist between the two archetypes as far as firm performance. This was tested by means of comparison with a test-T for independent samples, using the firm performance variable. Thus we can state that both configurations are equally efficient. This means that although they represent different strategies, both adjusted patterns are

good options for achieving an acceptable level of performance in service firms.

*Table 4. Integrated archetypes: Non-adjusted patterns*

<i>Construct</i>	<i>Archetype 1</i> (35)	<i>Archetype 2</i> (31)	F/t
Orientation towards personalisation	2.45	2.43	0.003
Technological intensity	5.10	5.71	5.616**
Pro-activity	4.35	5.63	27.487*
Internal ideas	4.22	5.52	33.352*
Competitive core ideas	4.09	5.28	33.033*
Ideas from institutions	2.30	4.44	59.256*
Internal incorporation	3.09	3.81	2.658
External incorporation	2.31	3.90	16.892*
Cooperative incorporation	2.00	2.65	6.338**
Internal exploitation	5.13	5.95	7.247*
External exploitation	1.58	2.70	16.455*
Cooperative exploitation	2.00	5.00	55.509*
Formal protection	1.79	3.84	24.254*
Informal protection	3.13	4.98	36.470*
Firm performance	2.26	2.46	-1.229 (Test-t)
* significant at 0.99; ** significant at 0.95			

The cluster analysis carried out with lower performance firms generated also two different archetypes: non-adjusted pattern 1, with 35 firms, and non-adjusted pattern 2, made up of 31 firms. Below, we describe the integrated production and innovation profile for both configurations, by highlighting the most important differences between them.

- Non-adjusted pattern 1: These firms develop a production strategy focused on standardisation (2.45), and they do not use much technology in their production process (5.10). Likewise this group of firms does not show much pro-activity (4.35) in innovation activities, with low scores in external (2.31), internal (3.09) and cooperative (2.00) incorporation of innovation, indicating their weak commitment to innovation and their low level of activity in this area. As a consequence all modes of innovation exploitation present a relatively low

importance. However, the best option for incorporating and exploiting the few innovations is internally. The most frequently used mechanism for maintaining new knowledge is informal (3.13) protection based on organisational decisions instead of rules and regulations. This archetype presents a certain similitude with “traditional services” according to the classification of Salter and Tether (2006). These are traditional *technology user* or *supplier dominated* firms. Due to a lack of professional and technical knowledge, they employ their soft skills which are more related to social and organisational innovation.

- Non-adjusted pattern 2: Like the archetype above, these firms also show an orientation toward a standardisation of production (2.43); however they show higher technological intensity (5.71) than firms within non-adjusted archetype 1. Their innovation strategy is proactive (5.63); they look to several sources for innovation ideas, including internal agents (5.62), competitive core (5.28) and research institutions (4.44). In addition, these companies generally develop their innovations through external and cooperative systems. In relation to methods of exploitation, they use a combination of internal (5.95), external (2.70) and cooperative (5.00) systems, illustrating their innovative dynamism. Protection of innovations is carried out by means of formal (3.84) and informal (4.98) mechanisms, although there is a clear preference for the latter. These firms are rather similar to businesses which supply “knowledge intensive services.” Due to their dynamism, they play an important role in innovation systems, because they show fluid interrelations with external agents.

The results of multiple comparisons between the four archetypes, obtained using ANOVA analysis, are shown in table 5. The central finding is that significant differences do exist. We have outlined four different behaviour patterns in service firms. The existence of differences between adjusted and non-adjusted archetypes means that more efficient firms develop different practices compared to less efficient ones. Moreover, there are two dissimilar patterns in higher performance firms, meaning that there is more than one strategy for achieving higher efficiency levels. Likewise, there are two different patterns among lower performance firms. It is then possible to identify best practices in service firms, which is to say optimal strategies for the achievement of acceptable performance levels.

Table 5. Comparison between adjusted and non-adjusted patterns: Mean differences

Construct	Non-adjusted	Archetype 1	Archetype 2
	Adjusted		
Orientation towards personalisation	Archetype 1	-0.849	-0.823
	Archetype 2	3.578**	3.604**
Technological intensity	Archetype 1	0.999**	0.394
	Archetype 2	0.595	-0.009
Pro-activity	Archetype 1	1.267**	-0.014
	Archetype 2	0.325	-0.955**
Internal ideas	Archetype 1	0.948**	-0.351
	Archetype 2	0.563	-0.736
Competitive core ideas	Archetype 1	0.797**	-0.395
	Archetype 2	0.328	-0.863*
Ideas from institutions	Archetype 1	1.618**	-0.516
	Archetype 2	0.400	-1.735**
Internal incorporation	Archetype 1	0.539	-0.181
	Archetype 2	1.814**	1.093
External incorporation	Archetype 1	1.635**	0.046
	Archetype 2	-0.139	-1.728**
Cooperative incorporation	Archetype 1	0.425	-0.220
	Archetype 2	1.814**	-0.545
Internal exploitation	Archetype 1	1.021**	0.198
	Archetype 2	1.196**	0.373
External exploitation	Archetype 1	0.662	-0.458
	Archetype 2	0.177	-0.943
Cooperative exploitation	Archetype 1	1.982**	-0.488
	Archetype 2	-0.043	-2.513**
Formal protection	Archetype 1	1.189*	-0.863
	Archetype 2	-0.535	-2.588**
Informal protection	Archetype 1	1.747**	-0.108
	Archetype 2	1.662**	-0.193
Service innovation	Archetype 1	0.750	-0.292**
	Archetype 2	0.300	-0.670
Process innovation	Archetype 1	0.900	-0.108
	Archetype 2	0.650	-0.033

Marketing innovation	Archetype 1	0.306	-0.033
	Archetype 2	0.306	-0.033
Consumer interaction innovation	Archetype 1	0.313	-0.075
	Archetype 2	0.388	0.000
Management innovation	Archetype 1	0.150	-0.183
	Archetype 2	0.300	-0.033
Strategic innovation	Archetype 1	0.229	-0.226
	Archetype 2	0.438	-0.017

\*\* significant at 0.99% \* significant at 0.95

## 5. Discussion and conclusions

The analysis above highlights an interesting structure within our sample of service firms in Spain, with four types of behaviour patterns – two adjusted and two non-adjusted – according to their performance levels. The key finding of our analysis is that significant differences between adjusted and non-adjusted behaviour patterns confirm the existence of strategic adjustment between production and innovation decisions. Therefore, firms whose organizational decisions are consistent achieve better performance compared to those with lower performance. This was the primary objective of the paper. Further interesting indications can be gained from both the comparative analysis between two adjusted patterns and multiple comparisons across them. These point out which patterns of decisional behaviour are most appropriate for service firms to achieve higher performance.

### 5.1 Bilateral comparisons between adjusted patterns

Higher performance firms in our sample are those exhibiting adjusted patterns, that is, internal consistency between strategic decisions which is more conducive to superior performance. Our analysis shows that both production strategies are conducive to better performance in service firms: standardisation for archetype 1 and customisation for archetype 2. Interestingly, this is not the case for what concerns innovation decisions whose outcomes in combination with either standardisation and customisation strategies are very different.

More specifically, as customisation does not appear within non-adjusted patterns, and



thus within lower performance firms, this strategy is more efficient independent of innovation decisions. Conversely significant variance is observed among innovation strategies between the two adjusted patterns, which in relation to either standardisation or customisation generate two different archetypes, both equally efficient.

The innovation strategy that is more consistent with standardisation is 'wider' in the sense that it is adopted by firms characterised by higher intensity of technology, more proactive attitude, use of multiple sources of ideas and of diverse forms of innovation protection. Conversely, the innovation strategy which is more consistent with customisation is 'narrower' in that it is associated to stronger focus on internal development, incorporation and exploitation. Moreover, firms in this archetype tend not to protect their innovations through formal systems. This can be due to the fact that customisation benefits from and impinges upon idiosyncratic resources and capabilities that are more related to differentiation.

### *5.2 Multiple comparisons*

Also comparisons between adjusted, or consistent, and non-adjusted, or inconsistent, patterns reveal interesting results. This is done by taking standardisation strategy as a reference, since this appears both in adjusted and non-adjusted patterns.

Different from adjusted patterns 1, innovation strategy in non-adjusted patterns 1 does not rely on knowledge produced in traditional research institutions, such as Universities. It is worth highlighting that these firms engage in low cooperation agreements which could be more adequate in the context of a personalized strategy of production. This is also relevant to the system for exploitation, except in internal exploitation. In addition, they do not use formal or informal mechanisms of protection, due to lower performance in relation to innovation.

Likewise, comparing adjusted patterns 1 with non-adjusted patterns 2 we observe lower technological intensity in the production process. These firms are also rather proactive in the innovation strategy; however they show a stronger orientation towards cooperation for incorporation and exploitation, possibly due to the necessity of sharing risks and investments. Although these firms are as innovative as those in the adjusted

pattern, their overall performance is lower. These two patterns do not present significant differences and therefore we can conclude that their configurations are rather similar. However, low variations that are not significant in relation to one individual dimension can give way to rather different configurations in a multidimensional level.

It is possible to synthesise the results about the configurations examined in this paper with three propositions:

P1: The orientation of production strategy towards customisation or standardization does not determine differences in the economic results of service firms.

P2: Firms which focus on customisation achieve better performance when their innovation decisions rely mostly on internal resources.

P3: Firms with standardized production obtain better results if these strategies are in combined with

P31: ... higher technological intensity.

P32: ... a balanced combination in methods of innovation incorporation.

P33: ... an internal orientation in decisions of innovation exploitation.

It is worth mentioning that our results confirm the findings of Salter and Tether (2006) about the existence of different innovation modes across diverse kinds of services, and indicate similarities between their classification of service activities and the integrated archetypes obtained by this paper.

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## Appendix 1. Table measure scales

SCALES	MEASURE	SOURCES		
<b>Personalisation of service</b>				
Services more customised than competitors	Seven-points Likert scale (degree of customisation)	Adapted from Sundbo (2002)		
Services more standardised than competitors				
<b>Use of technology in productive process</b>				
Use of technology in front-office activities	Seven-points Likert scale (degree of use)	Huerta and Larraza (2001)		
Use of technology in back-office activities				
Use of technology in general production process				
<b>Firm's attitude towards innovation</b>				
To prove technologies before competitors	Seven-points Likert scale (degree of importance granted by firm)	Oslo Manual (1997)		
To be pioneers introducing innovations				
To research in vanguard technology				
To develop new forms of producing services				
To fulfil improvement in productive process				
To fulfil improvement in existent services				
To introduce more quantity of services than competitor				
To invest in internal development of technology				
To have a internal I+D department				
<b>Sources of ideas to innovation</b>				
<b>Internal</b>				
Management of firm	Seven-points Likert scale (degree of importance granted by firm)	Oslo Manual (1997)		
Employees				
Production and distribution departments				
Marketing department				
R&D activities				
<b>External (competitive core)</b>				
Suppliers	Seven-points Likert scale (degree of importance granted by firm)	Oslo Manual (1997)		
Competitors				
Consumers				
Consultancies				
Fair and exhibitions				
<b>External (institutions)</b>				
Universities	Seven-points Likert scale (degree of importance granted by firm)	Oslo Manual (1997)		
Public research institutes				
Private research institutes				
Patents and licences system				
<b>Incorporation of innovation in firm</b>				
Internal individually	Dicotómica (likert 7 puntos)	Oslo Manual (1997)		
In cooperation				
External				
<b>Exploitation of innovación</b>				
<b>Exploitation internal</b>				
To exploit individually new services generated	Seven-points Likert scale (agreement degree in the statements)	González (2002)		
To incorporate their innovations in production process				
<b>Exploitation external</b>				
Transfer innovations to other firms				
Transfer rights of exploitation of innovation through licences				
Product R&D services to other firms				
Transfer innovations by selling part of firm				
Transfer innovation by selling equipments				
<b>Exploitation in cooperation</b>				
<b>Protection of innovation</b>				
<b>Formal-Explicit</b>				
Patents	Seven-points Likert scale (agreement degree in the statements)	Adapted from Oslo Manual (1997)		
Registration of product designs				
<b>Informal-Tacit</b>				
Protection of commercial secrets				
Complexity of service production				
Difficulty to transmit knowledge about innovation				
Improvements of services in continuous way				
Retention of employees in firm				
<b>Innovation results</b>				
Service innovation	Dichotomist	Bildeerbeek, Hertog,		
Process innovation				
Marketing innovation				

Interaction with consumer innovation		Marklund and Miles (1998)
Management innovation		
Strategic innovation		
<b>Firm performance</b>		
ROI in relation to competitors	Seven-point Likert scale (3 items in each variable)	Gupta and Govindarajan (1984)
Sale grow in relation to competitors		
Net profit in relation to competitors		
Share market in relation to competitors		
General performance in relation to competitors		