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Managing Systems and Innovation: An empirical study of Basque firms

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Abstract: The assumption that the innovation process is subject to historical conditions plays a central role in the evolutionary approach, what is reflected in various ways commonly used in studies on innovation. Thus, although business innovation has been seen by different authors and researchers as an evolving process, there are few studies that have conducted empirical studies on the influence of the historical conditions of the company on innovation, beyond the consideration of the firm age variable Control. This paper analyses the way management systems influence innovation in firms. Specifically, this paper focuses on studying innovation from an innovation performance, innovation management and innovation management tools (IMTs) holistic perspective. To this end, we propose a specific model of analysis, tested in a sample of 566 Basque companies in Northern Spain. Research results highlight that business innovation is related to companies´ previous development and implementation of management systems (MSs).

Keywords: Innovation, Innovation Management, Innovation Management Tools, Management Systems

1.1 Introduction

As a logical evolution in the competitiveness pathway, Basque companies are challenged nowadays with the need to innovation and improve their technology capacity. This new challenge will require as key actions the fostering of the inno-

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vative culture, the modernization and improvement of management and business organizations, and the development of management skills and leadership capabilities to drive and make possible the management of innovation.

In this direction, the aim of the present paper focuses on studying innovation from and a path dependence perspective. Thus, the main purpose is to understand how companies´ previous development and implementation of management systems (MSs), affects innovation in a holistic perspective (innovation performance, innovation management and innovation management tools – IMTs). The purpose of this paper is to understand whether the approach towards innovation it is based on an evolutionary approach from previously existing management systems implementations rather than a standalone approach.

After a brief introduction to innovation management and as well as management systems (MSs), we develop the methodology used in this study. Subsequently we show some empirical results of the investigation, including a conclusions section.

1.2 Business innovation: A holistic approach

The need for understanding innovation appears to be widespread, at business level. The research done into business innovation up till now, has failed to provide clear and consistent findings or coherent advice to managers, mainly because the concept is frequently disaggregated into component parts (Tidd, 2001).

Thus, scholars have adopted their own partial views and different researchers and institutions have tried to develop various models, typologies of elements of the innovation management process (Tidd, 2001) or synthesized frameworks of the innovation management process (Adams et al., 2006), that intend to guide innovation management research in a more holistic way.

Some researchers have developed studies regarding the measurement of innovative performance in enterprises (Mancebo Fernández and Valls Pasola, 2005), using instruments as the Community Innovation Survey instrument (CIS) trying to discover the factors that influence that result (Arundel and Hollanders, 2006). These studies consider an innovative company any company that performs product, process, marketing or organization innovations.

On the other hand, other scholars have investigate onto the role of innovation management and the analysis of its impact on innovation and innovation performance of firms (Rigby and Bilodeau, 2007, Adams et al., 2006, Prajogo and Ahmed, 2006), including the emphasis on the role of systems and tools (Chiesa et al., 1996).

Finally another incipient research approach it has been orientated to analyse the role of techniques and tools for managing innovation (Igartua et al., 2010, Hidalgo and Albors, 2008). Some authors have even worked towards the development of a

catalogue of tools, while a series of research programs led to the publication of practical guides to support the implementation of IMTs (Phaal et al., 2001).

Based on the literature review, we propose and holistic approach towards business innovation taking into account the approaches of several authors, in order to test the relationship between business innovation and management systems.

1.3 Innovation and Management Systems

Management systems (MSs) have developed in an unprecedented manner in the last few years. The impact generated by quality (To et al., 2012, Heras-Saizarbitoria, 2011), environmental (Heras-Saizarbitoria et al., 2011, Nishitani, 2009) and other MSs is demonstrated by different authors.

On the other hand, the assumption that the innovation process is subject to historical conditions plays a central role in the evolutionary approach, and represents the fact that evolution depends crucially on the path followed in the past (path dependency) (Mahoney, 2000 3743).

This assumption is reflected in various ways commonly used in studies of innovation. It is usual to reflect the cumulative nature of the innovation process representing the evolution of technologies through certain paths "technological trajectory" and avenues "Innovation Avenue". Also in the field of decision making in business, researchers have introduced the concept of "path dependency" and propose that the perspectives and decisions in the future are dependent and conditioned by that taken in the past.

Thus, although business innovation has been seen by different authors and researchers as an evolving process, which consists of several stages (Van de Ven et al., 2000 7545); there are few studies that have conducted empirical studies on the influence of the historical conditions of the company on innovation, beyond the consideration of the firm age variable Control. Therefore, the approach "path dependency" could help us understand the behaviour of firms and in particular of their leaders, when making the decision to innovate and manage.

In this context and closely related to the life cycle of enterprises, various authors have sought to identify the contribution of the different philosophies and principles of management in business innovation (Daniel I. Prajogo, 2007), taking as a guiding principle the cumulative nature of the innovation process (Nieto Antolín, 2003 1245), for which the innovation process is subject to historical conditions that determine their future evolution (path dependency). Some authors (Kelly and Amburgey, 1991 3715) highlight the importance of "momentum of the organization" to consider the practices, trends and strategies of the past make the organizations have a unique history, which makes it look differently opportunities (Cormican and O'Sullivan, 2004 3677).

1.3 Research methodology

The research was conducted through a survey targeted to business managers, as others research studies conducted in the field of innovation (O'Regan et al., 2006).

The research is based on survey focused on innovation management where top managers of 566 Basque companies over a defined universe of 6282 Basque companies, were asked to answer a structured questionnaire from December 2008 till April 2009.

The gathered data has been analysed using SPSS16 and statistical methods as T Student Test. Due to the fact that the sample meets the sampling criteria needed to ensure its representativeness, the implications of the study are directly extrapolated to the entire study population.

The variables used were based on literature review, and previous researches.

1.4 Results

In order to examine whether there are significant differences between the background in management systems of companies and their innovation results on products, a Student's t-test comparison of two means was developed. The results of this test are summarized in **Table 1.4.1** and **Table 1.4.2**.

Thus, in all cases (except for environmental management systems - EN) the t-statistic takes a critical levels of bilateral significance lower than the critical value of 0.005 rejecting the null hypothesis of equality of means, and therefore concluding that the historical background in management systems in Quality, CSR, R&D in companies that innovate in product is higher compared to those companies that do not innovate in product. However, regarding the innovation in services and using the same statistical method, only the historical background in management systems related to CSR and R&D is higher compared to those companies that do not innovate in services.

Table 1.4.1 Management Systems Means related to Product Innovation

		N	Mean	Std.D.	Std. Err. Mean
QA	Yes	363	3,37	1,162	,061
	No	185	2,96	1,080	,079
EN	Yes	363	2,95	3,011	,158
	No	185	2,53	1,048	,077

		N	Mean	Std.D.	Std. Err. Mean
CR	Yes	358	2,46	1,151	,061
	No	182	1,76	1,000	,074
RD	Yes	359	2,91	1,175	,062
	No	182	1,86	1,007	,075

On the other hand, background in all four management systems areas (Quality, Environmental, CSR, and R&D) is statistically higher (t-statistic lower than 0.005) for companies that innovate in processes.

Table 1.4.2 Student's t-test for Management Systems Means related to Product Innovation

		Levene´s test		t-Test for Equality of Means						
		F	Sig.	t	df	Sig.(2-talled)	Mean Diff.	Std. Err. Diff.	95% Conf. Interval of the Diff.	
									Lower	Upper
QA	Equalvar.ass.	15,457	,000	3,970	546	,000	,407	,103	,206	,608
	Equalvar.Notass.			4,065	395,044	,000	,407	,100	,210	,604
EN	Equalvar.ass.	1,892	,170	1,831	546	,068	,418	,228	-,030	,866
	Equalvar.Notass.			2,377	499,070	,018	,418	,176	,072	,763
CR	Equalvar.ass.	10,759	,001	6,919	538	,000	,694	,100	,497	,891
	Equalvar.Notass.			7,243	412,255	,000	,694	,096	,506	,883
RD	Equalvar.ass.	3,563	,060	10,247	539	,000	1,045	,102	,845	1,246
	Equalvar.Notass.			10,774	416,590	,000	1,045	,097	,855	1,236

Finally, for other kind of innovations (strategy, organizational structure, etc.), the historical background in management systems in Quality, CSR, R&D is statistically higher compared to those companies that do not innovate.

Table 1.4.3 Linear regression for Innovation Management Performance and Management Systems

Inn. Mgt. Performance Model

Model	R	R^2	Adj. R^2	Std.Err. of Estimate
1	,498[a]	,248	,246	,81347

a. Predictors: (Constant), MngtSystBack
b. Dependent Variable: InnMngtPerform

ANOVA[b]

Model		Sum of squares	df	Mean Square	F	Sig.
1	Regr.	122,129	1	122,129	184,561	,000[a]
	Resid.	371,229	561	,662		
	Total	122,129	1	122,129	184,561	,000[a]

a. Predictors: (Constant), MngtSystBack
b. Dependent Variable: InnMngtPerform

Model		Unstd. Coeff		Std.Coeff	t	Sig.
		B	Std.Error	Beta		
1	(Constant)	1,737	,091		19,040	,000
	MngtSystBack	,423	,031	,498	13,585	,000

a. Predictors: (Constant), MngtSystBack
b. Dependent Variable: InnMngtPerform

When analysing the innovation management performance of companies regarding their management systems deployment, a simple linear regression study was developed (see **Table 1.4.3**). The model takes a very high R (0.498) and R^2 indicating that 24.8% of the variability of performance in innovation management depends on the historical background in the implementation of management sys-

tems. In addition, the F statistic shows a value below the critical level (Sig 0.05), so it can be argued that both variables are linearly related.

Finally, we have performed a simple linear regression analysis, to research onto the use of innovation management tools in companies regarding their management systems deployment (see **Table 1.4.4**). The model takes a very high R (0.668) and R^2 indicating that 44.6% of the variability of the use of techniques and tools of innovation depends on the historical background in management systems. In addition, the F statistic shows a value below the critical level (Sig 0.05), so it can be argued that both variables are linearly related.

Table 1.4.4 Linear regression for Innovation Management Tools (IMTs) and Management Systems

Use of Inn. Mgt. Tools Model

Model	R	R^2	Adj. R^2	Std.Err. of Estimate
1	,668[a]	,446	,445	,56649

a. Predictors: (Constant), MngtSystBack
b. Dependent Variable: UseInnMngtTools

ANOVA[b]

Model		Sum of squares	df	Mean Square	F	Sig.
1	Regr.	144,589	1	144,589	450,561	,000[a]
	Resid.	179,709	560	,321		
	Total	324,297	561			

a. Predictors: (Constant), MngtSystBack
b. Dependent Variable: UseInnMngtTools

Model		Unstd. Coeff		Std.Coeff	t	Sig.
		B	Std.Error	Beta		
1	(Constant)	,839	,069		12,136	,000
	MngtSystBack	,173	,008	,668	21,226	,000

a. Predictors: (Constant), MngtSystBack
b. Dependent Variable: UseInnMngtTools

1.5 Discussion and conclusions

The main purpose of the article was to identify the link between business innovation and management systems implemented by companies. The business innovation approach was based on a holistic approach, gathering three complementary approaches (innovation results, innovation management performance and the use by organizations of innovation management tools-IMTs). On the other hand, four management systems were taken into account (quality, environmental, corporate social responsibility, and research and development), and discussion about their role within business innovation was discussed.

Based on the extended set of data (566 Basque companies in Northern Spain) and using statistical methods (Student's t-test and linear regression), the research has underlined the importance of companies´ previous development and implementation of management systems (MSs) on their innovation.

The three complementary approaches related to business innovation, seemed to be linked with companies´ management systems background. Thus, the companies that innovate in product do have a higher background in the implementation of Quality, CSR, and R&D management systems than those companies that do not innovate in product. However, innovation in services seems to be more related to historical background in CSR and R&D management systems deployment. On the other hand, background in all four management systems areas (Quality, Environmental, CSR, and R&D) is statistically higher for companies that innovate in processes, or introduce other kind of innovations (strategy, organizational structure, etc.). When analyzing these results, findings suggest that management systems play an important role in companies that develop innovations, although this role depends on the type of innovation being implemented. Furthermore, the role of environmental management systems in relation to product and services innovations seems to be questionable coinciding with previous researchers (Ramanathan et al., 2010, Shi et al., 2010, Wagner, 2008). Meanwhile, R&D management system´s importance for all type of innovations seems to remain important.

When analyzing the innovation management performance, results indicate that the variability of performance in innovation management depends on the historical background in the implementation of management, what underlines the importance of management systems as a forerunner of the management of innovation in companies. Special attention has been paid to the use of innovation management tools (IMTs). The results show that the variability on the use of IMTs depends on the historical background in the implementation of management. Therefore, companies that use more intensively IMTs seem to have a previous contrasted experience in the implementation of management systems.

Based on the discussed results, we consider that the systematic achievement of innovation results in companies requires a systematic management of innovation what it is very much related to the contribution of management systems philosophies and principles of management, as forerunners.

The limitations of this paper result from the research model and the variables used. Further research and analysis would provide more detailed relationships. On the other hand, the contributions of this study must be interpreted with a degree of caution since it has focused on the Basque context, which may have certain characteristics that can affect in the final performance.

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