Innovation and Performance: The Role of Environmental Dynamism on the Success of Innovation Choices

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***Abstract*—Innovation has become the cornerstone for achieving competitive advantage and is currently one of the principal topics of debate in the management literature. Innovations can be internally generated or can be adopted from external sources. Innovations also vary in terms of degree of radicalness. In this study, we examine the nature of innovation (in terms of where it is generated and its degree of radicalness) and an external environmental factor (dynamism) to identify the types of innovation that are more likely to succeed in different environments. Organizations expend substantial financial and human resources innovating. While some innovations succeed in enhancing organizational performance, many fail and may affect performance adversely in the short term. A sample of 381 Spanish firms was used to analyze how organizations, in order to be competitive, need to identify the appropriate type of strategies—in terms of innovation generation versus adoption, and extent of radicalness—that are consistent with the environmental conditions that they operate in. First, we find that in dynamic environments, the more radical and internally generated the innovations, the higher the company's perceived and objective performance. Second, we find that in stable environments, the less radical and more internally generated the innovations, higher the company's objective performance. Implications for theory and practice are discussed.**

***Index Terms*—Environmental dynamism, innovation, newness, performance, radicalness.**

I. Introduction

WITH the increase in globalization and the technological interconnections, organizations must innovate and make radical changes more frequently than in the past in order to stay competitive and survive [1]. Change is ubiquitous and innovation facilitates the process of adaptation to change. As Hitt *et al.* [2] argue, the ability of firms to develop new products, processes, and technologies is at the heart of strategic competitiveness. Therefore, one way for firms to gain the competitive edge is to seize the opportunities presented by the environment and constantly upgrade through innovation [3]. However, to upgrade and adapt, firms need to recognize environmental conditions, understand their consequences, and configure their assets and processes through appropriate innovation strategies.

Innovations have many dimensions and can manifest themselves in various forms [4]. They can be internally generated or externally adopted [5]. Innovations also vary in the extent to which they deviate from the existing state of the art—degree of radicalness [6]. Previous research has acknowledged innovation as a critical determinant of organizational performance and survival [7], [8]. However, unless the innovation phenomenon is bounded and contingency models are used to contextualize the relationships between innovation and performance, it becomes difficult to cumulate previous research findings with new results [7], [9], [10]. Following this idea, our paper sets out to answer the research question: *How do environmental dynamism and innovation radicalness moderate the relationship between the propensity to generate or adopt innovations and organizational performance?*

An earlier contingency model found that entrepreneurial orientation was related to performance and that environmental dynamism had an effect, especially on satisfaction with profitability and image development [11]. Here, we attempt to understand if perceiving the environment as dynamic or stable, together with the radicalness of the innovation that companies develop, influences the relationship between a company's propensity toward innovation generation/adoption and performance.

This paper contributes to the literature on innovation and contingency theories by arguing that to be competitive, organizations need to emphasize appropriate type of innovation strategies (both in terms of internal generation or external adoption and extent of radicalness) consistent with the environment in which they operate. In other words, we view the innovation–performance relationship in a rich interpretative context that incorporates external variables like the environment and internal variables like the nature of the innovation [12].

The paper proceeds as follows. The next section presents the theoretical background and is followed by a section where we present our hypotheses. The fourth and fifth sections empirically test the relationships. Finally, the main conclusion, contributions, limitations, and future lines of research are presented.

II. Theory Development

Firm resources and the external environment must be considered when crafting appropriate innovation strategies [13].

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Miller and Friesen [12] developed a series of contingent factors, both environmental and organizational to help explain the effectiveness of different organizational structures and strategies. The environmental factors included characteristics such as, dynamism, heterogeneity and hostility, and organizational factors included the ability to scan the environment, the extent of resources available and strategy-making variables as risk taking, etc. A contingency approach assumes that there is no "one best way" to structure or strategize, nor is there one best size for the firm; it all depends on coalignment among a number of factors. When the factors are aligned, firms experience above average performance than when they are not [14]. Below, we outline the contingency factors analyzed in this paper.

A. Nature of Innovation

Scholars generally define innovation as the development and use of new ideas or behaviors in organizations manifested in terms of a new product, service or method of production or a new market, organizational structure, or administrative system [6], [15]. This paper is focused on the nature of product innovation, which can be defined as the introduction into the market of technologically new or improved products [16], [17]. In the following section, we explain how this "nature of product innovation" can be defined in terms of the source of innovation (that the innovation can be internally generated or externally adopted) and in terms of its degree of radicalness.

B. Innovation Generation and Adoption

Damanpour and Wischnevsky [15] differentiate between the generation and the adoption of innovations. The generation of innovation refers to situations where a firm internally generates a product, process or technology that was previously unknown to the market in which the firm operates. If a firm adopts innovation, on the other hand, it assimilates knowledge and technologies that have been developed elsewhere and that are new to the organization only [14], [18]. This idea is consistent with the distinction made between exploration and exploitation in the organizational learning literature [19], [20], between innovation and imitation [21], [23], or as proposed by Teece [24] between "first movers" and "imitators." First movers (generators) are first to commercialize a new product or process in *the market and imitators (innovation adopters*) are typically followers [25]. We prefer Damanpour and Wischnevsky's [15] definition because it describes a useful distinction between innovations that are completely new to the world versus those that are new to the firm. In addition, it combines both generation and adoption under the common rubric of innovation, viewing them as two ways for firms to source new products.

C. Radical Versus Incremental Innovation

Radical innovations are characterized by being novel and totally different to the "state of the art" that already exists, while incremental innovations represent improvements that do not break with the existing technology [7]. Radical innovations have been labeled as discontinuous innovation [26] emerging technology [27], architectural innovation [28] or disruptive technology [4], [29] but no matter the nomenclature, there are common elements. They are associated with high market and technological uncertainty, they could cannibalize existing markets [30] and usually involve high investment of resources and high degree of risk for the innovating organization [7]. The high risk is due the uncertainty associated with the customer acceptance of the product [31], [32]. Radical innovations when successful help companies to create demand, develop new markets, and achieve growth and higher performance [16], [33] while incremental innovations take an earlier original idea as the starting point and make improvements that represent minor changes from existing practice to gain performance [7].

D. Environmental Dynamism

Mintzberg [13] created four dimensions to assess the environment: dynamism, complexity, diversity, and hostility. Some of the dimensions such as dynamism, complexity, and hostility have been reinforced by other classification schemes [34]. Environmental conditions vary because of the nature of competition in an industry (hostility), the stage of the life cycle of the industry (hostility, dynamism), the pace of change of technologies that dominates the industry (dynamism), the extent of interconnectedness among constituents in the environment (complexity), the number of stakeholders that organizations contend with (diversity), and finally the extent of resources available to the firm (hostility).

Dynamism has been shown to have a more significant impact on innovation. This makes sense because rapid change and uncertainty require quick organizational response and adaptation through innovation [6], [35], [36]. Dynamism can manifest in industries where consumer tastes and needs change rapidly and rates of obsolescence are high as compared to industries where change is slower and more predictable. Companies perceive their environments as dynamic when they compete in sectors with short product life cycles, when competition fosters frequent launching of new technologies and products in short time periods [37]–[39]. Finally, in regulated industries incumbents tend to be complacent and slower to change because they rely on regulatory impediments to slow new entrants into the market [40]. For companies in such industries, the constraints imposed by the regulations make the environment more stable; conversely when new entrants can freely enter an industry, the uncertainty of profits makes the environment more dynamic [40].

III. Hypotheses Development

When an organization seizes the opportunities presented by the environment and takes actions based on them, it is more likely to achieve superior competitive performance [11], [41]. Zahra and George [42] label this "realized absorptive capacity" where the firm absorbs knowledge from the environment, combines it with its own stock of knowledge and generates new products. Innovation adoption involves imitating a product from the environment without much local adaptation. The success of innovation generation versus adoption as a strategy depends on factors such as, whether the profits from the intellectual property can be appropriated by the innovating firm [43]; the firm's access to complementary assets that are necessary to make the product or process a success [24], [44]; the prevalence of switching costs [4], the market readiness, and the market acceptance of the product or technology [33], and a firm's ability to influence the dominant design and gain market share [24].

Research is mixed on whether innovation generation or adoption (innovation or imitation) is effective in dynamic environments [45], [46]. While some researchers [38], [44], [47] argue that innovation generation and first mover strategy may be appropriate in dynamic markets where there is technological uncertainty, due to the prevalence of numerous options and early "trial and error action" may provide useful information for quick and effective secondary action [47]; others [48], [49] are of the opinion that dynamic environments do not afford firms the luxury of experimentation that is a key to innovation generation; instead imitation may allow quick reaction to the competition. Additionally, prior to the emergence of the dominant design, it is argued that firms prefer to hedge their bets and wait rather than be an innovator [45]. However, we believe that environmental dynamism creates the need to be proactive using internally developed tacit knowledge. The resultant causal ambiguity acts as a barrier and inhibits interorganizational relationships. This in turn generally impedes imitation, particularly when the size and profiles of firms are vastly different, since it is hard to find a connection between one organization's solutions and another's problems [48]. In such situations, organizations that generate innovations tend to perform better than organizations that adopt them (imitate) [50], [51]. It has also been suggested that in dynamic, uncertain environments, herd behavior can result in wasteful use of resources and undesirable outcomes [48]. Based on these arguments, we are proposing that organizational performance in dynamic environments tends to be superior when organizations engage in generation rather than in adoption of innovations [22], [51].

The environment also plays an important role in determining the effectiveness of radical versus incremental innovations. Utterback and Abernathy [52] explained that in the early phase of a technology, often called the "fluid phase," industries tend to be more dynamic and radical product innovations are more successful. However, in the mature phase or the "specific phase" of the industry, when the "dominant design" has been established, and the industry is more stable, the emphasis should be on efficiency and cost control, and here, incremental process innovations perform better [53]. On the one hand, radical innovation strategy handles uncertain demand effectively by increasing market size through the addition of new market segments [9], [15], [54]. On the other hand, stable industries are better served by the adoption of incremental innovations and familiar well-known products by expanding the size of existing markets. We deepen this analysis by making the case that the relationship between innovation radicalness and the environment is cyclical; radical introduction of a product makes the environment more dynamic while incremental introductions generally keep the environments more stable.

Christensen [29] found that "one of the most consistent patterns in business is the failure of leading, incumbent companies to stay at the top of their industries when technologies or markets change." To cope with such failures, Khandwalla [55] has suggested that in dynamic environments, companies should undertake risk-taking strategies and have organic structures, both of which favor the development of radical innovations. [6], [56]. In dynamic environments, the underlying market structure and customer needs are constantly evolving and radical innovations that serve the current market segment in new ways or the exploit new domains seem to work more effectively [9], [57]. Additionally, radical innovations tend to be "stand alone" and underlying knowledge tends to be more complex, and therefore, more appropriable to the organizations that develop them [58]. Finally, it has been demonstrated that the link between radicalness and commercial performance was very strong in dynamic environments [16]. Radical innovations, constituted about 20% of the innovations in each industrial subsector and 60% of them were commercial successes; while incremental innovations constituted 60% of all innovations where only 10–15% were commercial successes. Based on the arguments of several researchers [16], [29], [55], [58] it seems that introducing radical innovations will increase the positive effect of innovation generation on organizational performance in dynamic environments. Following the same ideas, it also seems that incremental, or less radical, innovations, could increase the negative effect of innovation adoption on organizational performance in dynamic environments.

Based on previous research, we theorize that in dynamic environments, innovation generation is a more effective strategy than innovation adoption [24], [25], [59], [60] we also propose that this relationship will be moderated by innovation radicalness. Therefore,

Hypothesis 1a: The more dynamic the environment and the more radical the innovation, the stronger the positive relationship between the propensity to generate innovations and organizational performance.

Hypothesis 1b: The more dynamic the environment and the less radical the innovation, the stronger the negative relationship between the propensity to adopt innovations and organizational performance.

There are several reasons why the impact of innovation adoption on performance could be reinforced in a stable environment. First, in stable environments, where change is more gradual, imitation or innovation adoption can defuse rivalry, and reduce the risk and the resources required to adapt for any given firm. Knowledge that rivals will respond with similar actions also lowers the incentive for firms to act aggressively to gain competitive advantage [6], [48]. When competitors take similar actions, there is less likelihood for firms to have a performance differential among them and thus the adoption of innovations from outside or imitation helps maintain the status-quo. Second, organizational learning theory suggests that stable environments value exploitation or innovation adoption that is associated with efficiency and cost effectiveness more than expensive R&D associated with exploration or innovation generation [20]. Xue *et al.* [61] demonstrated that environmental stability moderates the link between investment in information technology and measures of efficiency. Therefore, modifying what other organizations have already introduced saves costs and helps improve performance in stable environments. Stable environments also facilitate product imperfections to be ironed out by other organizations before adoption by the focal organization [24].

In stable environments, incremental innovations that are lower in risk provide the competitive edge and are primarily adopted to reformulate existing outcomes and systems rather than to create entirely new ones [6], [62]. First, among new firms in stable environments, the ability to introduce cost saving practices and adapt their production processes (incremental process innovations) increased the probability of survival and reduced the liability of newness [63].

Second, Christensen and Overdorft [62] argue that sustaining technologies or incremental innovations make a product or service perform better in ways that existing customers in the mainstream market "already value." By using the terms "already value," the authors are expressing implicitly that the market is relatively stable, and the innovating firm does not have to create new markets or generate innovations and the needs of the customer or the technologies in use are not changing dramatically; therefore, companies can focus on adopted innovations that increase efficiency of the customer.

Overall, earlier research suggests that in stable environments, innovation adoption (imitation) has a higher probability of profitable performance than innovation generation [6], [56]. Such environments are characterized by longer product life cycles where customers demand similar products with minor modifications [37]. Adoption of incremental innovations would also be the more efficient solution in stable environments and previous studies suggest a higher likelihood of positive financial outcomes for firms that engage in exploitation by concentrating in the areas of its established routines and capabilities [61], [64]. That is, product radicalness could potentially inhibit the positive impact that innovation adoption will have on the company's performance of firms operating in stable environments. Therefore, we propose that

Hypothesis 2a: The more stable the environment and the more radical the innovation, the stronger the negative relationship between the propensity to generate innovations and organizational performance.

Hypothesis 2b: The more stable the environment and the less radical the innovation, the stronger the positive relationship between the propensity to adopt innovations and organizational performance.

IV. Methodology

A. Research Design and Sample

To test our hypotheses, we sampled a variety of firms that were involved in the launch of new products. We started out with a sampling frame that covered Spanish firms from the industries most likely to exhibit innovative behaviors.[1] We used the SABI/AMADEUS database (the most comprehensive database of company information in Spain) to identify all companies in these industries. There are a total of 2942 firms having more than ten workers in our target industries.

Data for most of the study's variables were collected between March and November 2006. In January 2008, objective data for the dependent variable (2007 ROS) were obtained using the SABI/AMADEUS database. To collect data for most of the variables, first, the 2942 firms were contacted by telephone, and, shortly thereafter, all firms interviewed were sent a mail survey. Because the unit of analysis adopted in this study was the department where the innovation activity of the company is carried out, we spoke to the R&D Manager. If the firm did not have an R&D Manager, we spoke to the CEO instead. In total, 2765 firms responded to our phone calls (response rate of 94%). During the interview, we first ensured that the firm indeed belonged to the sample frame, i.e., that it operated within one of the target sectors and that it had more than ten employees. Those firms with less than ten employees (19), that do not belong to our target sectors (539), or that were duplicated or without innovative activity (443) were excluded from our sample. We asked the remaining 1764 firms if we could send them our questionnaire. In total, 402 firms responded to this questionnaire and of those 381 responses were considered valid and usable. This corresponds to a response rate of 21.6% of the firms in our target population. The questionnaire asked firms to state the number of products introduced during the past 5 years. All firms responded that they had introduced at least one new product during this time frame, which speaks to the validity of our sample.

In order to check for nonresponse bias, we compared mean differences between respondents and nonrespondents for industry membership, number of employees, and revenue. No significant differences were found, suggesting that nonresponse bias was not present.

B. Measures

Many of the constructs included in the study were measured with multiitem scales. We took several steps to ensure data validity and reliability. First, we pretested all measures in 25 interviews with R&D Managers and asked them to closely review the survey, to ensure the clarity of the questions, and to ascertain whether or not the scales captured the desired information. We then revised any potentially confusing items before submitting the questionnaire.

C. Dependent Variables

Performance: We have used an objective and a subjective measure of performance (see Table I). The objective measure was 2007 ROS and was obtained from the SABI/AMADEUS database. We have chosen this index because it is one of the most used in this kind of research. We decided to use 2007 data to reduce the reverse causality effect encountered in many cross-sectional studies. Also, the time lag between this independent variable and dependent variables (obtained between March and June 2006) is also important because the performance effect of

[1]The National Statistical Institute (INE) of Spain identified five industries of the economy as containing the most 'innovative' firms. These industries are: NACE 24, Chemical companies; NACE 32, Radio, TV, and communication equipment; NACE 33, Medical, precision, and optical instruments; NACE 34, Manufacture of motor vehicles, trailers, and semitrailers; and NACE 35, Manufacture of other transport equipment.

TABLE I
MEASUREMENT MODEL

DEPENDENT VARIABLES
Objective Performance: 2007 ROS
Subjective Performance (Deshpandé et al., 1993) (Cronbach's alpha = 0.821) Relative to your business' largest competitor *(1* = Much Lower; 4 =Similar; 7= Much higher) P1.The profits obtained by your firm are P2. The size of your firm is P3. The market share of your firm is P4. The rate of growth that your firm has is
INDEPENDENT VARIABLES
Inclination of firms to emphasize innovation or imitation (Cronbach's alpha = 0.746) II1. Your company acquires other companies' innovations to develop its own (vs. Your company develops its innovations based on its own ideas and knowledge without using ideas from other companies) II2. Your company uses imitation as a common practice and is never the first launching products (vs. Your company does not use imitation as a common practice and is always the first launching products) II3. Your company responds to innovations produced by other companies in its market to copy them (vs. Your company responds to its clients' needs generating products that are new to its reference market)
Radicalness (Subramaniam and Youndt, 2005) (Cronbach's alpha = 0.769) You obtain innovations that R1. Make your prevailing products obsolete R2. Fundamentally change your prevailing products R3. Make your existing expertise in prevailing products obsolete
Environmental dynamism (Khandwalla, 1977) (Cronbach's alpha = 0.673) D1. Our firm must rarely change its marketing practices to keep up with the market and competitors (vs Our firm must change its marketing practices extremely frequently) D2. The rate at which products/services are becoming obsolete in the industry is very slow (vs The rate of obsolescence is very high) D3. Actions of competitors are quite easy to predict (vs Actions of competitors are unpredictable) D4. Demand and consumer tastes are fairly easy to forecast (vs Demand and tastes are almost unpredictable) D5. The production/service technology is not subject to very much change and is well established (vs The modes of production/service change often and in major ways)
CONTROL VARIABLES
Size: Naperian Log of the number of workers
Age: 2009-fundational year
External R&D: external expenditure on R&D as average % of the sales turnover of the company for the last 5 years
Internal R&D: internal expenditure on R&D as average % of the sales turnover of the company for the last 5 years
Industry: Dummy for industries 24, 32, 33, 34 and 35

innovation is not simultaneous. As it has been noted in previous research, there is at least a two-year time lag between innovation and performance in the most turbulent industries and typically the time lag is much longer [65]. Therefore, given that our innovation variable measures innovations developed in the previous 5 years, our performance measure could be capturing the performance benefit of innovations developed in the previous 7 years.

For our subjective measure, we used the variable developed by Deshpandé *et al*. [66] that captures the perception of the respondent in relation to his business' largest competitor in terms of profits, size, market share, and growth (see Table I).

D. Independent Variables

Innovation generation and innovation adoption: Building on the definitions and measures of Lieberman and Montgomery [25], and Zhou [54], we developed a three-item, seven-point opposite statements scale to measure the inclination of a company to generate or adopt innovations. The first item relates to whether ideas for new products are generated internally or taken from other companies. The second item asks if the firm uses imitation as a common practice or not, while the third item taps the extent to which the company tries to copy innovations launched by other companies (see Table I).

EFA and CFA of these three items showed that the items loaded on one common factor with factor loadings above 0.50. When summed to a scale, the Cronbach's alpha of the scale was 0.746 and the composite reliability was 0.77, suggesting high internal consistency and reliability. Our CFA also showed that the construct exhibited sufficient validity. This is demonstrated by the adequate model fit: CFI, GFI, and AGFI are above 0.9; the p value for the Satorra–Bentler χ^2 was not significant ($p > 0.05$); and the Robust RMSEA was significant ($p < 0.05$).

Radicalness: The scale for measuring radicalness was adapted from the one proposed by Subramaniam and Youndt [67]. These authors base their work on Tushman and Anderson [26] and Henderson and Clark [68], and define radical innovative capacity as the organizational ability that allows a company to make obsolete the existent products. These authors measure radical innovative capacity with three items. To obtain the information, the interviewees were asked to point out the correct answer, in relation to the products introduced in the market in the last 5 years. The Cronbach's alpha of the scale was 0.769, suggesting high internal consistency and reliability (see Table I).

Given the potential subjectivity associated with these types of scales (innovation generations and innovation adoptions and radicalness), we took several steps to ensure content validity. First, we selected a random subsample of 50 R&D managers and asked them to describe each of the products launched during the past 5 years. This information came from their descriptions and also from documents or web information where the products were described in detail. We then analyzed if the products were new to the world (internal generation of innovation), or new to their focus market, or just new to their company (adopted

TABLE II
MEANS, STANDARD DEVIATIONS, AND CORRELATIONS

Variables	Mean	S.D.	N	1	2	3	4	5	6	7	8	9
1. ROS 2007	-0.006	0.257	330	1								
2. Subjective Performance	3.815	1.106	381	-0.012	1							
3. Innovation Generation vs. Adoption	4.288	1.370	381	0.055	0.160 **	1						
4. Innovation Radicalness	3.423	1.251	381	0.013	0.166 **	0.130 *	1					
5. Firm Size	3.965	1.225	381	-0.158 **	0.194 **	-0.028	0.022	1				
6. Firm Age	49.165	172.936	381	0.014	0.010	-0.004	-0.016	0.039	1			
7. Internal R&D expenditures	9.710	14.603	381	0.000	0.011	0.176 **	0.163 **	-0.036	-0.019	1		
8. External R&D expenditures	2.500	6.900	381	-0.297 **	0.076	0.068	0.124 *	-0.020	-0.005	0.284 **	1	
9. Environmental dynamism	3.491	0.988	381	0.039	-0.008	0.129 *	0.212 **	0.074	0.054	0.169 **	0.060	1

* p<.05 ** p<.01 ***<.001
Note: all of the values are the actual ones except for the size that was logarithmic transformed (because of its dispersion).

innovations). Finally, we collected information about the degree of change incorporated in each of the products to determine if they were radical or incremental in nature. For each of these firms, we then created two indexes reflecting the proportion of innovations launched and the proportion of radical innovations. The correlation between these indexes (transformed into a seven-point scale) and our scales were 0.38 ($p < 0.01$) and 0.403 ($p < 0.01$), respectively. When we corrected our scales for measurement error with the Cronbach's alpha value, as recommended in the literature [70], the correlation between the underlying constructs was 0.50, suggesting high convergent validity.[2] Because we used a random subsample, we can extrapolate this correlation to the target population. Finally, we also correlated our innovation generated and innovation adopted (scales) with the number of patent documents presented in the Spanish and European Patent Offices. These data were directly obtained from the Spanish and the European patent offices. We obtained a correlation of 0.24 ($p < 0.01$) (0.32 for the underlying constructs). Taking into account that not all innovations are patented, this provides additional validation of the scale. Taken together, these extensive validations suggest that our scales are valid.

Environmental dynamism: It was measured using [55] scale (seven points Likert scale). This scale has been used in several innovation studies. The scale consists of five opposite statements. The Cronbach's alpha of the scale was 0.669 suggesting sufficient internal consistency and reliability (see Table I). We used the scores on environmental dynamism scale to split firms into dynamic and stable environments. The sample was divided into two groups based on the mean (3.491) and the standard deviation (0.988) of the variable. We have labeled companies operating in stable environments to those that scored less than 2.5 or one standard deviation below the mean and we have labeled companies operating in very dynamic environments to those that scored more than 4.5 (one standard deviation above the mean). We have run the analyses independently for these two subsamples of firms.

Control Variables: We controlled for organizational size, age, internal, and external R&D expenditures, and industry (see Table I). The internal and external R&D expenditures information was obtained from the questionnaire, while we took the size, age, and industry data from the SABI/AMADEUS database. Size was operationalized as the number of employees, and due to its dispersion, we used a log transformation of the variable. Industry effects were captured by dummy variables for each firm's main sector as indicated by their industry code (NACE code) taken from the sample frame. Dummy variables were created for industries 24, 32, 33, 34, and 35 (see Table I).

V. ANALYSES AND RESULTS

Descriptive statistics and correlations for the relevant variables are displayed in Table II. The skewness and kurtosis statistics were within the boundaries of normality [69], allowing the use of parametric tests of significance. To assure that multicollinearity was not an issue, variance inflation factors (VIFs) were computed (not reported due to space limitations). None of them reached above 2, indicating that we did not encounter multicollinearity.

Our hypotheses were tested using hierarchical regression analysis and an interaction effect only exists if the interaction term is significant over and above the direct effects of the independent variables. We have four regressions. The first regression analyzes objective performance for companies operating in dynamic environments (see Table III), the second regression analyzes subjective performance for companies in dynamic environments (see Table IV), the third analyzes objective performance for companies operating in stable environments (see Table V), and the last analyzes subjective performance for companies in stable environments (see Table VI). In each of the tables, we have a base model, a main effects model, and an interactions model.

Table III represents the results for objective performance in dynamic environments. The base model in Table III (control variables only) explains a statistically significant share of the variance in the performance (adjusted $R^2 = 0.331$, $p < 0.001$). External R&D expenditures negatively influence company's performance. That means that investing on external knowledge acquisition has a negative impact on the company's objective performance. The main effects model makes a nonsignificant contribution over and above the base model ($R^2 = 0.008$, $p > 0.1$). The interaction term makes a significant contribution over and above the main effects ($^\wedge R^2 = 0.034$, $p < 0.05$). To determine the nature of the interaction, we plotted the effect of innovation generation on the dependent variable for values of

[2]The consistency between different measures is typically tested using correlation coefficients, but it is difficult to specify a single threshold upon which two measures can be considered to support concurrent validity. For correlation coefficients in general, argues that 0.1 is a small correlation, 0.3 a moderate and 0.5 a large correlation. Based on this, we consider correlations between 0.3 and 0.49 to reflect moderate concurrent validity and correlations of 0.50 and above to reflect high concurrent validity.

TABLE III
OBJECTIVE PERFORMANCE IN DYNAMIC ENVIRONMENTS

	Base Model			Main Effect Model			Contingent Model		
	β		t statistic	β		t statistic	β		t statistic
Dummy for Industry 24	0.022		0.318	0.021		0.301	0.039		63
Dummy for Industry 32	-0.044		-0.570	-0.042		-0.530	-0.040		-0.519
Dummy for Industry 33	0.072		0.882	0.065		0.781	0.071		0.838
Dummy for Industry 34	-0.026		-0.365	-0.024		-0.321	-0.034		-0.466
Size	-0.010		-0.609	-0.011		-0.691	-0.012		-0.780
Age	0.000		0.733	0.000		0.656	0.000		0.700
Internal R&D expenditures	0.002		1.507	0.002		1.293	0.001		1.202
External R&D expenditures	-0.023	***	-7.333	-0.022	***	-6.817	-0.021	***	-6.713
Main effect variables									
Radicalness				0.018		1.088	0.110	†	-1.912
Innovation Generation vs. Adoption				-0.005		-0.327	-0.102	*	-2.282
Interaction									
Innovation x Radicalness							0.028	*	2.312
Model									
R^2	0.384			0.392			0.426		
Adjusted R^2	0.331			0.325			0.356		
F statistic	7.247	***		5.867	***		6.074	***	
Change in R^2				0.008			0.034	*	
Change in F				0.599			5.345		

† $p < 0.1$; * $p < 0.05$. ** $p < 0.01$. *** $p < 0.00$. (n=102). Dynamism > 4.5.

TABLE IV
SUBJECTIVE PERFORMANCE IN DYNAMIC ENVIRONMENTS

	Base Model			Main Effect Model			Contingent Model		
	β		t statistic	β		t statistic	β		t statistic
Dummy for Industry 24	-0.299		-0.863.	-0.017		-0.052	-0.068		-0.207
Dummy for Industry 32	-0.724	†	-1.920	-0.516		-1.446	-0.493		-1.415
Dummy for Industry 33	-0.744	†	-1.868	-0.639	†	-1.705	-0.632	†	-1.726
Dummy for Industry 34	-0.584		-1.566	-0.362		-1.019	-0.261		-0.749
Size	0.137		1.567	0.140		1.593	0.128		1.599
Age	0.000		0.464	0.000		0.216	0.000		0.202
Internal R&D expenditures	-0.001		-0.162	-0.007		-1.254	-0.006		-1.156
External R&D expenditures	0.028		1.657	0.030		1.813	0.029	†	1.834
Main effect variables									
Radicalness				0.270	***	3.417	0.906	***	3.427
Innovation Generation vs. Adoption				0.143	†	1.914	0.614	**	3.054
Interaction									
Innovation x Radicalness							-0.136	*	-2.516
Model									
R^2	0.106			0.230			0.272		
Adjusted R^2	0.044			0.162			0.200		
F statistic	1.695			3.355	***		3.770	***	
Change in R^2				0.124			0.042	*	
Change in F				9.037	***		6.329		

† $p < 0.1$; * $p < 0.05$. ** $p < 0.01$. *** $p < 0.00$. (n=123). Dynamism > 4.5.

radicalness set at one standard deviation above and below the mean, as suggested by [70]. This plot is reported in Fig. 1. The plot in this figure shows that performance increases with higher levels of innovation generation and radicalness, and decreases with lower levels of radicalness and innovation generation. This finding provides support for hypotheses H1a and H1b.

Table IV presents the results for subjective performance in dynamic environments. The base model in Table IV (control variables only) does not have a significant relationship with performance. The main effects model makes a significant contribution over and above the base model ($^\wedge R^2 = 0.124$, $p < 0.001$). Taking into account the effects of each main variable, we find that both radicalness and emphasis on innovation generation positively and significantly influence subjective performance. The interaction term makes a significant contribution over and above the main effects ($^\wedge R^2 = 0.042$, $p < 0.05$). To determine the nature of the interaction, we plotted the effect of innovation generation on the dependent variable for values of radicalness set at one standard deviation above and below the mean, as suggested by Cohen and Cohen [70]. This plot is reported

TABLE V
OBJECTIVE PERFORMANCE IN STABLE ENVIRONMENTS

	Base Model			Main Effect Model			Contingent Model		
	β		t statistic	β		t statistic	β		t statistic
Dummy for Industry 24	0.006		0.064	0.076		0.856	0.073		0.854
Dummy for Industry 32	-0.064		-0.579	0.049		0.449	0.072		0.683
Dummy for Industry 33	0.037		0.312	0.126		1.126	0.120		1.105
Dummy for Industry 34	-0.106		-1.044	0.003		0.033	0.005		0.047
Size	0.018		0.911	0.028		1.545	0.021		1.183
Age	-0.003	**	-3.048	-0.004	***	-4.205	-0.005	***	-4.680
Internal R&D expenditures	-0.001		-0.608	0.000		-0.032	0.000		-0.050
External R&D expenditures	-0.003		-0.264	0.001		0.109	0.001		0.113
Main effect variables									
Radicalness				-0.039	†	-1.938	-0.159	*	-2.619
Innovation Generation vs. Adoption				0.041	**	2.816	-0.037		-0.933
Interaction									
Innovation x Radicalness							0.026	*	2.081
Model									
R^2	0.270			0.407			0.461		
Adjusted R^2	0.146			0.276			0.326		
F statistic	2.172	†		3.095	**		3.415	**	
Change in R^2				0.138			0.053		
Change in F				4.332	**		4.332	*	

† $p < 0.1$; * $p < 0.05$. ** $p < 0.01$. *** $p < 0.00$. (n=56). Dynamism < 2.5.

TABLE VI
SUBJECTIVE PERFORMANCE IN STABLE ENVIRONMENTS

	Base Model			Main Effect Model			Contingent Model		
	β		t statistic	β		t statistic	β		t statistic
Dummy for Industry 24	0.072		0.127	0.344		0.592	0.337		0.573
Dummy for Industry 32	0.138		0.197	0.580		0.768	0.553		0.718
Dummy for Industry 33	1.484	†	1.904	1.871	*	2.382	1.869	*	2.356
Dummy for Industry 34	0.474		0.763	0.977		1.491	0.969		1.460
Size	0.236	†	1.808	0.271	*	2.133	0.279	*	2.101
Age	-0.011		-1.434	-0.016	*	-2.127	-0.016	*	-2.054
Internal R&D expenditures	-0.017		-1.050	-0.011		-0.685	-0.011		-0.678
External R&D expenditures	0.105		1.158	0.122		1.367	0.122		1.350
Main effect variables									
Radicalness				-0.127		-0.883	-0.029		-0.064
Innovation Generation vs. Adoption				0.251	*	2.276	0.318		1.027
Interaction									
Innovation x Radicalness							-0.022		-0.231
Model									
R^2	0.229			0.307			0.307		
Adjusted R^2	0.108			0.165			0.149		
F statistic	1.892	†		2.167	*		1.937	†	
Change in R^2				0.078			0.001		
Change in F				2.746	†		0.053		

† $p < 0.1$; * $p < 0.05$. ** $p < 0.01$. *** $p < 0.00$. (n=60). Dynamism < 2.5.

in Fig. 2. The plot in this figure shows that performance is higher for higher levels of innovation generation and radicalness. This figure suggests that, while for low levels of radicalness, the proclivity to generate innovations has an important impact on performance, in case of high radicalness, the relationship between the proclivity to generate innovations and performance is negative but higher than in case of low radicalness. These results provide partial support for H1a and do not support to H1b.

Taking the results in Tables III and IV together, we find partial support for hypotheses 1a and 1b. That is, in dynamic environments, generating radical innovations and adopting less radical ones increase performance (support for h1a and h1b). For hypothesis 1a, we find support for the objective measure of performance, and partial support for the subjective measure of performance. With respect to the subjective measure, our results demonstrate that employees perceive that, in dynamic environments, innovation generation positively increases performance.

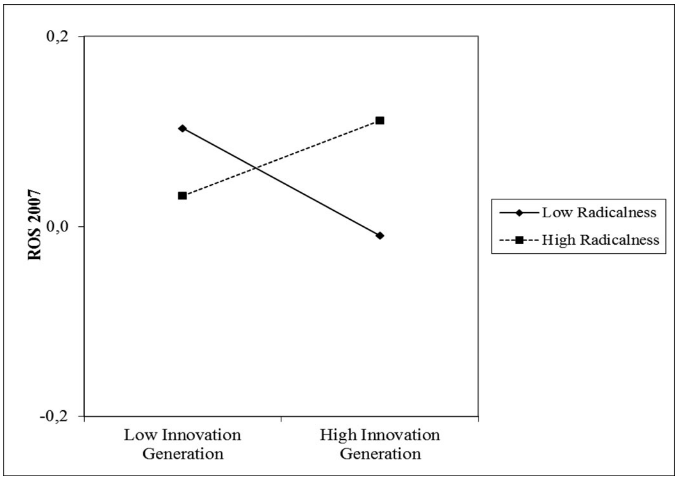

Fig. 1. Interaction effects for objective performance in dynamic environments.

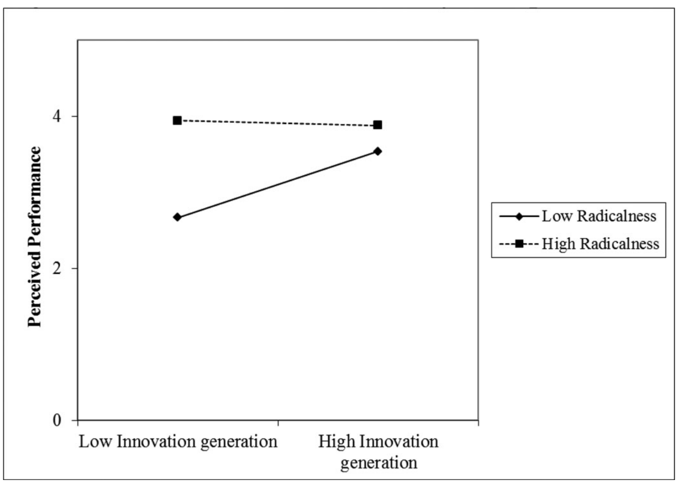

Fig. 2. Interaction effects for subjective performance in dynamic environments.

Additionally, the results show that radical innovations have a higher impact on perceived performance than incremental ones (partial support for h1a). However, employees also perceived that when incrementally innovating, generation has a bigger impact on performance than adoption (opposite to what we hypothesized on h1b).

Table V represents the results for objective performance in stable environments. The base model in Table V (control variables only) explains a statistically significant share of the variance in the performance (Adjusted $R^2 = 0.146$, $p < 0.05$). Taking into account the effects of each control variable, only company's age negatively influences objective performance. Older firms tend to have lower ROS. The main effects model makes a significant contribution over and above the base model ($^\wedge R^2$ 0.138, $p < 0.01$). Taking into account the effects of each main variable, we find that while radicalness negatively and significantly influences objective performance, innovation generation positively and significantly influences that measure. The interaction term makes a significant contribution over and above the main effects ($^\wedge R^2 = 0.053$, $p < 0.05$).

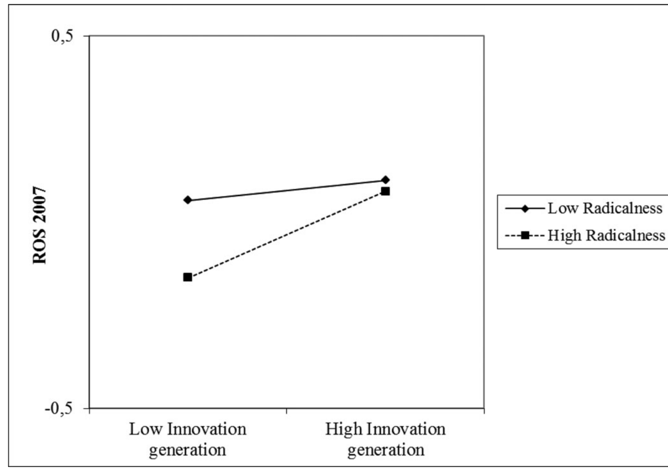

Fig. 3. Interaction effects for objective performance in stable environments.

To determine the nature of the interaction, we plotted the effect of innovation generation on the dependent variable for values of radicalness set at one standard deviation above and below the mean, as suggested by Cohen and Cohen [70]. This plot is reported in Fig. 3. The plot in this figure shows that performance is lower for higher levels of radicalness but increases when generating versus adopting innovations. This finding provides partial support for hypotheses 2a and 2b.

Table VI represents the results for subjective performance in stable environments. The base model in Table VI (control variables only) explains a statistically significant share of the variance in the performance (Adjusted $R^2 = 0.108$, $p < 0.1$). Taking into account the effects of each control variable, market orientation positively influences the subjective performance. The main effects model makes a significant contribution over and above the base model ($^\wedge R^2 = 0.078$, $p > 0.1$). The interaction term does not make a significant contribution over and above the main effects ($^\wedge R^2 = 0.001$, $p > 0.1$)

Taking the results obtained in Tables V and VI together, our findings provide partial support to hypotheses 2a and b. First of all, it is important to say that we do not find significant relationships for subjective measures of performance. Taking into account what we have found with the objective measure of performance, we find partial support for H2a and H2b that suggest that radicalness harms performance in stable environments, while incrementality reinforces it. However, contrary to our expectations, we find that generating both radical and incremental innovations improves a company's performance.

VI. Discussion and Conclusion

Innovation has become the cornerstone for achieving competitive advantage and is currently one of the principal topics of debate in the management literature [54], [71]. There is a wealth of literature that demonstrates the positive effects of innovation generation on a company's competitiveness. The degree of imitation has been studied as well, in companies that avoid being imitated [21] and those that encourage it [72]. Our research deepens this understanding by further unbundling innovation into two dimensions and supporting the notion that radical and incremental innovation generation and adoption are organizational behaviors that can engender a sustainable competitive advantage.

A recent issue of AMJ [73] had a letter from the editors entitled: "*Beyond contextualization: using context theories to narrow the micro-macro gap in management research*." This letter emphasizes the importance of contextualizing research to make relevant contributions to the literature. Taking that lead, our study has attempted to analyze the innovation phenomenon by using the context as an important predictor. Consequently, we have used the type of industry environment (dynamic versus stable) in which companies operate as a determinant of the innovation success. With this contextualization, we have hypothesized that in order to increase performance, companies operating in dynamic environments should move before their competitors (generate rather than adopt innovations) developing more radical products, while companies operating in stable environments should focus more on incremental internally generated products.

By contextualizing our research using the nature of innovation and the environment in which it is developed, we make the following contribution to the extant literature. First, we found that internally generated innovations seem to positively influence company's performance in both dynamic and stable environments. This finding is interesting because it could explain some of the inconsistencies in the literature. In the hypotheses development section, we explained that research was mixed on whether innovation generation or adoption (innovation or imitation) was effective in dynamic environments. Our findings show that one of the reasons that there is such a big debate is that it is not just the environment that determines the success of an innovation, but it seems that generation as a strategy seems to be more effective across environment types. Second, the environment related choice that companies need to make when deciding to innovate, relates more to the degree of change (emphasis on radical or incremental) than generation versus adoption. To perform better, it seems that companies need to focus on generation of radical innovations in dynamic environments and incremental innovations in stable industries.

These results have led us to believe that if a company is able to use the stability of the environment to generate incremental innovations, such companies should be able to appropriate most of the innovations rents, and be able to achieve better levels of performance. Generation of innovations, radical or incremental, require investment in R&D and formal investments in R&D are the initial step in a sequence of investments in technology which in course of time will provide the firm the requisite skills for absorbing knowledge and technologies from the outside [42], [57].

Our results are consistent with the literature in some of its findings. However, they also open some opportunities for new lines of research. Some of our findings build on previous work on innovation and performance. First, our results support those of other authors [24], [25], [47], [51], [59] who suggest that in dynamic environments, innovation generation or being a first mover is likely to be a superior strategy to that of innovation adoption or being a imitator. First movers, possibly take advantage of the uncertainty of switching and consequent customer loyalty in a turbulent environment [4], [36]. As we have said before, some of inconsistency among different authors could be resolved if we look the innovation process as generation and adoption. Second, consistent with earlier research [6], [61], [62] we have found that in stable environments, innovating incrementally is more profitable than innovating radically. Having found these results in a different "context" than the original research (they developed their empirical work in USA and we have done it in Spain), helps generalize both their findings and ours.

One of the most interesting findings of this study is the relationship between dimensions of innovation and a subjective measure of performance. It is evident that the more tangible and observable the dimension of innovation [74] the stronger the association with the subjective or perceived measure of performance [75]. For example, in dynamic environments, innovation generation seemed to be significantly linked to perceived performance. When employees see and have experience with internally generated innovations, they perceive the organization as a high performer. As a corollary, adoption of incremental innovations is not perceived as being innovative by employees although they might deliver superior objective performance. Additionally, variations in the firms that constitute the referent group can also cause significant variability in the assessment of subjective performance and when the focal firm is smaller than the referent group, they may tend to deflate their performance more [51], [76]. Therefore, we should be aware of the how using different measures of performance may show differing results and we need to be aware of how subjective measures of performance are influenced [51], [76], [77].

Limitations and further study: Like all studies, ours has some limitations that future research should address. First, because our intention was to look at innovation phenomena, we have focused on five industries that have been traditionally involved in innovative activity and excluded firms in these industries that had not recently launched any products. While we believe that this is an appropriate approach, given our research interest, care must be taken in generalizing our findings to other industries. In addition, our data were collected only in Spain, which further limits the generalizability

Second, we have used a definition of innovation generation and adoption that includes only the "successful" new products that reach the market. Consequently, the sample has a proinnovation bias. Other definitions of innovation are possible, covering more or less of this "success" criterion [78]. Although we believe that ours is a highly relevant view of innovation generation and adoption, supported by the literature, we do not know how other conceptualizations of these key variables would have influenced our findings.

Finally, the data we relied on were mainly cross sectional. Therefore, it is impossible to infer causality in any strict sense. The theory we used assumes specific causal directions, but alternative causal relationships cannot be ruled out. Future research needs to consider these issues carefully

Our contributions and limitations, taken together, lead us to propose some new avenues for research. First, given the importance of knowledge, it would be interesting to prove that different types of knowledge could lead to innovation generation or adoption in differing degrees. Second, we would also like to explore these ideas in other industries to discover if the findings are generalizable.

REFERENCES

[1] C. Markides and S. Crainer, “Innovating globally,” *Bus. Strategy Rev.*, vol. 21, pp. 24–27, 2010.

[2] M. A. Hitt, R. E. Hoskisson, and H. Kim, “International diversification: Effects on innovation and firm performance in product-diversified firms,” *Acad. Manage. J.*, vol. 40, pp. 767–798, 1997.

[3] M. E. Porter, “Technology and competitive advantage,” *J. Bus. Strategy*, vol. 5, pp. 60–78, 1985.

[4] H. Gatignon, M. L. Tushman, W. Smith, and P. Anderson, “A structural approach to assessing innovation: Construct development of innovation locus, type, and characteristics,” *Manage. Sci.*, vol. 48, pp. 1103–1122, 2002.

[5] I. P. Mahmood and C. Rufin, “Government’s dilemma: The role of government in imitation and innovation,” *Acad. Manage. Rev.*, vol. 30, pp. 338–360, 2005.

[6] F. Damanpour and S. Gopalakrishnan, “Theories of organizational structure and innovation adoption: The role of environmental change,” *J. Eng. Technol. Manage.*, vol. 15, pp. 1–24, 1998.

[7] F. Damanpour, “Organizational innovation: A meta-analysis of effects of determinants and moderators,” *Acad. Manage. J.*, vol. 34, pp. 555–590, 1991.

[8] K. G. Smith, C. J. Collins, and K. D. Clark, “Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms,” *Acad. Manage. J.*, vol. 48, pp. 346–357, 2005.

[9] D. De Clercq, N. Thongpapanl, and D. Dimov, “The moderating role of organizational context on the relationship between innovation and firm performance,” *IEEE Trans. Eng. Manage.*, vol. 58, no. 3, pp. 431–444, Aug. 2011.

[10] R. A. Wolfe, “Organizational innovation: Review, critique and suggested research directions,” *J. Manage. Stud.*, vol. 31, pp. 405–431, 1994.

[11] A. Jantunen, K. Puumalainen, S. Saarenketo, and K. Kyläheiko, “Entrepreneurial orientation, dynamic capabilities and international performance,” *J. Int. Entrepreneurship*, vol. 3, pp. 223–243, 2005.

[12] D. Miller and P. H. Friesen, “Archetypes of strategy formulation,” *Manage. Sci.*, vol. 24, pp. 921–933, 1978.

[13] H. Mintzberg, “An emerging strategy of direct research,” *Administ. Sci. Quart.*, vol. 24, pp. 580–589, 1979.

[14] F. Damanpour and S. Gopalakrishnan, “The dynamics of the adoption of product and process innovations in organizations,” *J. Manage. Stud.*, vol. 38, pp. 45–65, 2001.

[15] F. Damanpour and J. Daniel Wischnevsky, “Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations,” *J. Eng. Technol. Manage.*, vol. 23, pp. 269–291, 2006.

[16] B. Achilladelis and N. Antonakis, “The dynamics of technological innovation: The case of the pharmaceutical industry,” *Res. Policy*, vol. 30, pp. 535–588, 2001.

[17] *Oslo Manual: Proposed Guidelines for Collecting and Interpreting Technological Innovation Data,* 3rd ed., OECD/Eurostat, Paris, 1997.

[18] S. Gopalakrishnan and F. Damanpour, “The impact of organizational context on innovation adoption in commercial banks,” *IEEE Trans. Eng. Manage.*, vol. 47, no. 1, pp. 14–25, Feb. 2000.

[19] J. G. March, “Exploration and exploitation in organizational learning,” *Org. Sci.*, vol. 2, pp. 71–87, 1991.

[20] C. A. Siren, M. Kohtamahki, and A. Kuckertz, “Exploration and exploitation strategies, profit performance, and the mediating role of strategic learning: Escaping the exploitation trap,” *Strategic Entrepreneurship J.*, vol. 6, pp. 18–41, 2012.

[21] Y. Brozen, “Invention, innovation, and imitation,” *Amer. Econ. Rev.*, vol. 41, pp. 239–257, 1951.

[22] A. Pérez-Luño, R. V. Cabrera, and J. Wiklund, “Innovation and imitation as sources of sustainable competitive advantage,” *Manage. Res.: The J. Iberoamerican Acad. Manage.*, vol. 5, pp. 67–79, 2007.

[23] J. A. Schumpeter, *The Development Economics*. Oxford: Oxford Univ. Press, 1961.

[24] D. J. Teece, “Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy,” *Res. Policy*, vol. 15, pp. 285–305, 1986.

[25] M. B. Lieberman and D. B. Montgomery, “First-mover (dis)advantages: Retrospective and link with the resource-based view,” *Strategic Manage. J.*, vol. 19, pp. 1111–1125, 1988.

[26] M. L. Tushman and P. Anderson, “Technological discontinuities and organizational environments,” *Administ. Sci. Quart.*, vol. 31, pp. 439–465, 1986.

[27] G. S. Day and P. J. H. Schoemaker, “Avoiding the pitfalls of emerging technologies,” *California Manage. Rev.*, vol. 42, pp. 8–33, 2000.

[28] W. J. Abernathy and K. B. Clark, “Innovation: Mapping the winds of creative destruction,” *Res. Policy*, vol. 14, pp. 3–22, 1985.

[29] C. M. Christensen, *The Innovator’s Dilemma: When New Technologies Cause Great Firms To Fail*. Boston, MA, USA: Harvard Business Press, 1995.

[30] P. Hurmelinna-Laukkanen, L. M. Sainio, and T. Jauhiainen, “Appropriability regime for radical and incremental innovations,” *R&D Manage.*, vol. 38, pp. 278–289, 2008.

[31] S. Ram and J. N. Sheth, “Consumer resistance to innovations: The marketing problem and its solutions,” *J. Consum. Marketing*, vol. 6, pp. 5–14, 1989.

[32] C. A. Di Benedetto, W. S. DeSarbo, and M. Song, “Strategic capabilities and radical innovation: An empirical study in three countries,” *IEEE Trans. Eng. Manage.*, vol. 55, no. 3, pp. 420–433, Aug. 2008.

[33] S. A. Zahra and A. P. Nielsen, “Sources of capabilities, integration and technology commercialization,” *Strategic Manage. J.*, vol. 23, pp. 377–398, 2002.

[34] G. G. Dess and D. W. Beard, “Dimensions of organizational task environments,” *Administ. Sci. Quart.*, vol. 29, pp. 52–73, 1984.

[35] R. D’Aveni, “Hypercompetition managing the dynamics of strategic maneuvering,” New York, USA: The Free Press, 1994.

[36] F. Suarez and G. Lanzolla, “The role of environmental dynamics in building a theory of first-mover advantages,” *Acad. Manage. Rev.*, vol. 32, pp. 377–392, 2007.

[37] R. W. Zmud, “An examination of ‘push-pull’ theory applied to process innovation in knowledge work,” *Manage. Sci.*, vol. 30, pp. 727–738, 1984.

[38] P. Aghion and R. Griffith, *Competition and Growth: Reconciling Theory and Evidence*, MA, USA: MIT Press, 2005.

[39] P. P. Saviotti and A. Pyka, “Product variety, competition and economic growth,” *J. Evol. Econ.*, vol. 18, pp. 323–347, 2008.

[40] A. W. McArthur and P. C. Nystrom, “Environmental dynamism, complexity, and munificence as moderators of strategy-performance relationships,” *J. Bus. Res.*, vol. 23, pp. 349–361, 1991.

[41] E. Penrose, *The Theory of the Growth of the Firm*. Oxford, U.K.: Oxford Univ. Press, 1959.

[42] S. A. Zahra and G. George, “Absorptive capacity: A review, reconceptualization, and extension,” *Acad. Manage. Rev.*, vol. 27, pp. 185–203, 2002.

[43] A. Tuppura, P. Hurmelinna-Laukkanen, K. Puumalainen, and A. Jantunen, “The influence of appropriability conditions on the firm’s entry timing orientation,” *J. High Technol. Manage. Res.*, vol. 21, pp. 97–107, 2010.

[44] D. C. Mueller, “First-mover advantages and path dependence,” *Int. J. Ind. Org.*, vol. 15, pp. 827–850, 1999.

[45] T. Fischer and J. Henkel, “Capturing value from innovation—Diverging views of RandD and marketing managers,” *IEEE Trans. Eng. Manage.*, vol. 59, no. 4, pp. 572–584, Nov. 2012.

[46] S. Rajagopalan, “Adoption timing of new equipment with another innovation anticipated,” *IEEE Trans. Eng. Manage.*, vol. 46, no. 1, pp. 14–25, Feb. 1999.

[47] J. Baum and S. Wally, “Strategic decision speed and firm performance,” *Strategic Manage. J.*, vol. 24, pp. 1107–1129, 2003.

[48] M. B. Lieberman and S. Asaba, “Why do firms imitate each other?,” *Acad. Manage. Rev.*, vol. 31, pp. 366–385, 2006.

[49] D. E. Hatfield, L. F. Tegarden, and A. E. Echols, “Facing the uncertain environment from technological discontinuities: Hedging as a technology strategy,” *J. High Technol. Manage. Res.*, vol. 12, pp. 63–76, 2001.

[50] J. Wiklund and D. Shepherd, “Entrepreneurial orientation and small business performance: A configurational approach,” *J. Bus. Venturing*, vol. 20, pp. 71–91, 2005.

[51] D. Strang and M. C. Still, “Does ambiguity promote imitation, or hinder it? An empirical study of benchmarking teams,” *Eur. Manage. Rev.*, vol. 3, pp. 101–112, 2006.

[52] J. M. Utterback and W. J. Abernathy, "A dynamic model of process and product innovation," *Omega*, vol. 3, pp. 639–656, 1975.
[53] C. M. Christensen, F. F. Suarez, and J. M. Utterback, "Strategies for survival in fast-changing industries," *Manage. Sci.*, vol. 44, pp. S207–S220, 1998.
[54] Z. Zhou, "Innovation, imitation, and new product performance: The case of china," *Ind. Marketing Manage.*, vol. 35, pp. 394–402, 2006.
[55] P. N. Khandwalla, *The Design of Organizations*. vol. 260. New York, NY, USA: McGill Univ. Press, 1977.
[56] C. S. Koberg, D. R. Detienne, and K. A. Heppard, "An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation," *J. High Technol. Manage. Res.*, vol. 14, pp. 21–45, 2003.
[57] A. Cuervo-Cazurra and C. Annique Un, "Why some firms never invest in formal R&D," *Strategic Manage. J.*, vol. 31, pp. 759–779, 2010.
[58] P. P. Saviotti, "On the dynamics of appropriability, of tacit and of codified knowledge," *Res. Policy*, vol. 26, pp. 843–856, 1998.
[59] C. Bowman and N. Collier, "A contingency approach to resource-creation processes," *Int. J. Manage. Rev.*, vol. 8, pp. 191–211, 2006.
[60] A. Pérez-Luño, J. Wiklund, and R. V. Cabrera, "The dual nature of innovative activity: How entrepreneurial orientation influences innovation generation and adoption," *J. Bus. Venturing*, vol. 26, pp. 555–571, 2010.
[61] L. Xue, G. Ray, and V. Sambamurthy, "Efficiency or innovation: How do industry environments moderate the effects of firms' IT asset portfolios?," *Manage. Inform. Syst. Quart.*, vol. 36, pp. 509–528, 2012.
[62] C. M. Christensen and M. Overdorf, "Meeting the challenge of disruptive change," *Harvard Bus. Rev.*, vol. 78, pp. 66–76, 2000.
[63] E. Cefis and O. Marsili, "Born to flip. Exit decisions of entrepreneurial firms in high-tech and low-tech industries," *J. Evol. Econ.*, vol. 21, pp. 473–498, 2011.
[64] H. Wang and J. Li, "Untangling the effects of overexploration and overexploitation on organizational performance: The moderating role of environmental dynamism," *J. Manage.*, vol. 34, pp. 925–951, 2008.
[65] B. Cassiman, R. Veugelers, and P. Zuniga, "Diversity of science linkages: A survey of innovation performance effects and some evidence from flemish firms," *Econ.: Open-Access, Open-Assessment E-J.*, vol. 4, pp. 1–26, 2010.
[66] R. Deshpandé, J. U. Farley, and F. E. Webster, Jr., "Corporate culture, customer orientation, and innovativeness in Japanese firms: A quadrad analysis," *J. Marketing*, vol. 57, pp. 23–37, 1993.
[67] M. Subramaniam and M. A. Youndt, "The influence of intellectual capital on the types of innovative capabilities," *Acad. Manage. J.*, vol. 48, pp. 450–463, 2005.
[68] R. M. Henderson and K. B. Clark, "Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms," *Administ. Sci. Quart.*, vol. 35, pp. 9–30, 1990.
[69] S. S. Shapiro and M. B. Wilk, "An analysis of variance test for normality (complete samples)," *Biometrika*, vol. 52, pp. 591–611, 1965.
[70] J. Cohen and P. Cohen, *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. vol. 3891. Mahwah, NJ, USA: Lawrence Erlbaum Associates.
[71] S. L. Brown and K. M. Eisenhardt, "Product development: Past research, present findings, and future directions," *Acad. Manage. Rev.*, vol. 20, pp. 343–378, 1995.
[72] K. R. Conner, "Obtaining strategic advantage from being imitated: When can encouraging "Clones" Pay?," *Manage. Sci.*, vol. 41, pp. 209–225, 1995.
[73] P. Bamberger, "Beyond contextualization: Using context theories to narrow the micro-macro gap in management research," *Acad. Manage. J.*, vol. 51, pp. 839–846, 2008.
[74] E. M. Rogers, *Diffusion of Innovations*. New York, NY, USA: The Free Press, 1983.
[75] S. Gopalakrishnan, "Unraveling the links between dimensions of innovation and organizational performance," *J. High Technol. Manage. Res.*, vol. 11, pp. 137–153, 2000.
[76] H. J. Sapienza, K. G. Smith, and M. J. Gannon, "Using subjective evaluations of organizational performance in small business research," *Amer. J. Small Bus.*, vol. 12, pp. 45–53, 1988.
[77] A. Chamanski and S. J. Waago, "Organizational performance of technology-based firms-the role of technology and business strategies," *Enterprise Innovation Manage. Stud.*, vol. 2, pp. 205–223, 2001.
[78] A. Nerkar and S. Shane, "Determinants of invention commercialization: An empirical examination of academically sourced inventions," *Strategic Manage. J.*, vol. 28, pp. 1155–1166, 2007.

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