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A cross-cultural analysis of intellectual asset protection in SMEs

The effect of environmental scanning

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Abstract

Purpose – This paper aims to examine the effect of national culture on the capacity of small and medium-sized biotechnology enterprises to protect their intellectual assets by analysing the mediator role of environmental scanning behaviour. The extent to which environmental scanning behaviour helps firms to protect their intellectual assets is investigated, and the effects of national cultural values on environmental scanning behaviour are analysed.

Design/methodology/approach – The hypotheses are tested with survey data from 123 biotechnology SMEs located in 14 countries.

Findings – Environmental scanning appears to be an important step in the intellectual property strategy, as it enhances the firm's capacity to protect its intellectual assets. Nevertheless, the results show that firms located in cultures with high uncertainty avoidance, high power distance and low individualism do more scanning, whereas the capacity to protect intellectual assets is perceived as being more important in firms located in cultures with low uncertainty avoidance, low power distance and high individualism.

Research limitations/implications – Certain limitations should be noted. For instance, the research is based on cross-sectional data, which provide limited insight into the temporal aspects of dynamic environments.

Practical implications – The study has important implications for practitioners. It demonstrates that, in international working relationships, cultural values have a direct effect on environmental scanning behaviour, and hence an indirect effect on intellectual property (IP) protection capability. Given the strategic importance of scanning and IP for innovative firms, the results could help managers to make strategic decisions, specifically in R&D internationalization through decentralization or partnership.

Originality/value – Although few studies have empirically analysed the role of environmental scanning in a particular domain, such as intellectual property strategic management, or adopted a comparative cross-cultural design to do so, this paper investigates the role of environmental scanning in intellectual property strategy from a cross-cultural perspective.

Keywords National cultures, Intellectual property, Cross-cultural studies, Strategic management, Strategic choices

Paper type Research paper

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Introduction

This paper analyses the effect of national cultural values on the capacity of small and medium enterprises (SMEs) to protect their intellectual assets.

The appropriability problem is a vital concern for any innovation firm. The ability to obtain a return on R&D investment is closely linked to the capacity to protect intellectual assets (Levin *et al.*, 1987; Harabi, 1995). Difficulties in appropriating rents may diminish incentives to invest in the first place. Most of the research on intellectual property protection investigates patenting strategies to maintain the value of intellectual assets (McEvily *et al.*, 2004; Laursen and Salter, 2005). Patents legally protect innovators from any form of imitation. It has been shown that more developed economies tend to provide stronger intellectual property protection (Ginarte and Park, 1997). Patent protection is influenced by the country's research and development (R&D) activity, market environment and international integration (Ginarte and Park, 1997). Marron and Steel (2000), Husted (1999), stress that this protection depends on cultural factors. National culture is therefore critical in the intellectual property business (Yang, 2005). Numerous studies have also shown that enterprises adapt their management practices to the national cultures in which they operate (Smith *et al.*, 2001; Newman and Nollen, 1996; Hofstede, 1983; Schneider and De Meyer, 1991; Ritchie and Brindley, 2005).

Given that, beyond the benefits, patents have several inherent disadvantages – for instance, it is often difficult to prove that a patented innovation has been imitated – firms develop and use alternative business practices to complement and reinforce legal mechanisms (Levin *et al.*, 1987; Cohen *et al.*, 2000). These managerial practices are generally embedded in the firm's global strategy, involving all departments and functions (Rao and Klein, 1994; Nickerson and Silverman, 1998: Kitching and Blackburn, 1998). More particularly, it has been suggested that successful intellectual asset protection is associated with the firm's understanding of the intellectual property rights system and its ability to deploy internal resources to scan the environment and gain a better understanding of the enterprise's built-in intangible assets (Yang *et al.*, 2004; Yang, 2004). Information gathering and analysis is critical to the development and maintenance of successful innovation strategies (Zumd, 1983) and strategic planning process (Schendel and Hofer, 1979). Environmental scanning is a necessary condition for achieving performance (Daft *et al.*, 1988; Barringer and Bluedorn, 1999; Ogunmokun and Ng, 1999; Beal, 2000; Howell and Shea, 2001) and is associated with champion behaviour (Howell and Shea, 2001).

Because environmental scanning involves an organization-environment interface, it would be expected to differ across cultures. Although environmental scanning has received much attention in the management literature (e.g., Aguilar, 1967; Hambrick, 1982, Sawyerr *et al.*, 2000, Sawyerr, 1993), there are few comparative studies across countries. Most of the research on executive scanning behaviour has been limited to the United States (e.g. Hambrick, 1981, 1982; Daft *et al.*, 1988; Garg *et al.*, 2003). Other studies analyse scanning behaviours in transition economies (Elenkov, 1997; May *et al.*, 2000; Stewart *et al.*, 2008; Ebrahimi, 2000a, b) and developed countries (Sawyerr *et al.*, 2000; Sawyerr, 1993), and suggest that national culture may influence executive environmental scanning behaviour.

This paper examines the effect of national cultural values on the firm's capacity to protect its intellectual assets by analysing the mediator role of environmental scanning behaviour. The purpose is twofold:

(1) to investigate the extent to which environmental scanning behaviour helps firms protect their intellectual assets; and

(2) to analyse the effects of national cultural values on the environmental scanning behaviour of executives of biotechnology SMEs.

The next section provides a review of the literature on scanning activity, and distinguishes between external and internal environmental scanning behaviour. Five research hypotheses are then formulated regarding the firm's capacity to protect its intellectual assets and the effect of national cultural values. The research method is then outlined, and the empirical results of the statistical analysis are presented and discussed. A conclusion follows.

1. Environmental scanning behaviour

Environmental information gathering, or environmental scanning, is a critical element of strategic decision making (Hambrick, 1981; Barringer and Bluedorn, 1999; Aguilar, 1967; Daft *et al.*, 1988; May *et al.*, 2000; Danneels, 2008). In high-velocity environments, products and services have relatively short life cycles (Eisenhardt, 1989). Firms in such environments must adopt short planning horizons, and may develop scanning mechanisms to detect shifts in environmental trends that provide opportunities (Barringer and Bluedorn, 1999). External environmental scanning is the first link in the chain of perceptions and actions that permit an organization to adapt to its environment (Aguilar, 1967; Hambrick, 1981).

In order to successfully adapt, organizations must scan both the external and internal environments. Garg *et al.* (2003, p. 726) stress that:

> If a firm's capabilities are indeed important to performance, executive scanning must produce astute comprehension of changes in both the external environment and the internal circumstances of a firm before effective adaptation can occur, and both must be considered in scanning research.

Scanning therefore has two dimensions: external environmental scanning and internal environmental scanning (often called audit strategy). Environmental scanning favours the development of the firm's R&D and marketing competences (Danneels, 2008), generates ideas for innovative products and services (e.g. Hyland and Beckett, 2005), represents the firm's dynamic capability (Eisenhardt and Martin, 2000; Danneels, 2008) and provides a competitive advantage (Audet and d'Ambroise, 1998) that positively affects the firm's performance (Barringer and Bluedorn, 1999; Ogunmokun and Ng, 1999; Beal, 2000; Howell and Shea, 2001; Daft *et al.*, 1988).

Given that the capacity to protect intellectual assets can be viewed as a performance dimension, scanning activity may influence the firm's capacity to protect its intellectual assets.

2. Hypotheses

2.1 Environmental scanning and intellectual property

The managerial literature contains both narrow and broad definitions of intellectual property (IP). Traditionally defined as an intangible creation of the human intellect for which a firm will grant protection, intellectual property covers the customary legal protections of patents, copyrights, trademarks and trade secrets. Hence, according to the narrow definition, IP consists of all "legal mechanisms for protecting corporate

assets and infrastructure assets" (Nyberg and Saru, 1999). We instead retain the broad definition proposed by Nickerson and Silverman (1998), a more managerial concept in which IP also includes intangible assets such as idiosyncratic knowledge.

External environmental scanning and intellectual property management. Nickerson and Silverman (1998, p. 321) stress that:

> ... intellectual capital and IP management involves the establishment of monitoring, measurement and management practices that secure intellectual assets for use by the firm and that scan the environment for competitive threats or opportunities for these intellectual assets.

In a study on intellectual property abuses in foreign markets, Yang *et al.* (2004) propose three strategies to challenge piracy:

(1) proactive approaches;

(2) defensive weapons; and

(3) networking practices.

They note that the Microsoft strategy is a proactive approach that focuses on monitoring markets and relevant products. This means that "company employees survey the market to ensure that any fakes are detected and sales prevented" (Yang *et al.*, 2004, p. 467). Rabino and Enayati (1995) underscore that to create entry barriers, firms may build defensive or offensive strategies, and the first step is to identify intellectual property assets and delimit the market. Haley (2000) emphasises that managers need to evaluate intellectual property environments. Thumm (2001, p. 268) notes that:

> The first prerequisite of strategic patenting is the active observation of competitors' patenting portfolios, which is already necessary to identify market niches and to place products in the right position in the market.

He cites a European report in which 89 per cent of the respondent agreed that monitoring competitors' patents was an effective way to obtain competitive intelligence. In a recent paper, Chaudhry *et al.* (2009) describe some best practices to preserve intellectual property rights and manage counterfeit markets. For instance, market monitoring cannot be ignored. External environmental scanning leads firms to define their intellectual property strategy, reducing information asymmetry regarding competitor behaviour. Environmental scanning allows fake detection (Yang *et al.*, 2004) and effective management of trade secrets (Hemphill, 2004).

Taken together, these empirical results lead to our first hypothesis:

H1a. External environmental scanning positively affects the firm's ability to protect its intellectual assets.

Internal environmental scanning and intellectual property management. The resource-based view has repeatedly emphasised the importance of analysing the firm's internal strengths and weaknesses during the strategy-making process (Wernerfelt, 1984). Garg *et al.* (2003, p. 727) stress that "Most scanning studies have examined only the external scanning aspects ...". Studies on intellectual property management suggest that internal environmental scanning is an important step in intellectual property management and protection (Ch'ang and Yastreboff, 2002; Brown and Prescott, 2000; Rabino and Enayati, 1995; Hanel, 2004). The main question is "how can you protect and manage, let alone exploit, IP assets that you are not even aware that you own, or worse,

you think you own, but do not?" (Ch'ang and Yastreboff, 2002, p. 173). Given their intangible nature, intellectual property (IP) assets are inherently invisible, and firms must therefore delimitate and identify the knowledge that is worth protecting in order to capture benefits and returns on R&D investment (Levin *et al.*, 1987). IP auditing aims to systematically identify and record the IP that a business has acquired or developed in-house, and to determine the extent of intellectual property asset ownership. IP auditing provides firms with the ability to prioritize intellectual property, assess vulnerability and develop a protection and growth plan that reinforces the IP strategy (Brown and Prescott, 2000). Internal audits lead enterprises to classify their intellectual assets (Hanel, 2004) in order to better prioritize intellectual property and assess their vulnerability (Brown and Prescott, 2000). In their study of Australian businesses, Ch'ang and Yastreboff (2002) stress the importance of IP auditing for firms and develop a multi-step model to guide enterprises. Hemphill (2004) argue that the first step in protecting a trade secret is a trade secret audit. Identifying key IP assets is therefore critical for effective asset management.

This leads to the following hypothesis:

H1b. Internal environmental scanning positively affects the firm's ability to protect intellectual property.

2.2 National culture and environmental scanning

Environmental scanning behaviour depends on managerial perceptions of environmental attributes (Sawyerr, 1993; Daft *et al.*, 1988), and it varies widely across countries (Sawyerr, 1993; Stewart *et al.*, 2008; Ebrahimi, 2000a, b). Sawyerr (1993) describes the role of the political and socio-cultural environment in scanning activity and compares Nigerian and American managerial behaviours. In a comparative study of environmental scanning practices in Korean and USA firms, Ghoshal (1988) found that, although the scanning behaviours of American and Korean firms are quite similar, on average, they differ significantly in the way they are realized. Mukherji and Hurtado (2001, p. 110) note the important role of culture in strategic decision making for environmental assessment and strategic response. "Culture is likely to have a considerable power (both theoretical and statistical) to explain differences in perception, behavior and action". While there has been much discussion of scanning behaviours that differ across countries, there is little discussion on the underlying reasons for these differences. We suggest that scanning activity may be related to national cultural values, because it depends on the way managers perceive their environment (Boyd and Fulk, 1996; Schneider, 1989).

Hofstede's (1983) values approach identifies four empirical dimensions of culture:

(1) uncertainty avoidance;

(2) power distance;

(3) individualism/collectivism; and

(4) masculinity/femininity.

Environmental scanning: a proactive activity. Depending on their perception, some managers view the environment relatively passively, while others actively search for desired information (Aguilar, 1967). In the inactive mode, managers receive unsolicited information with no scanning effort. In the proactive mode, managers carefully scan and screen information before problems arise (El Sawy, 1985). According to Lee and

Peterson (2000), cultures that encourage entrepreneurship are classified as proactive. At the same time, it has been shown that entrepreneurs have higher masculinity values than managers (Hayton *et al.*, 2002). Masculine societies are defined as aggressive and more task- and performance-oriented (Jones and Teegen, 2001).

Consequently, more scanning may occur in masculine societies. Hence:

H2a. The higher the masculine value of the national culture, the more firms will scan the external environment.

H2b. The higher the masculine value of the national culture, the more firms will scan the internal environment.

Environmental scanning: a method of uncertainty absorption. Following Daft *et al.* (1988), perceived strategic uncertainty is associated with the use of external and internal scanning information. Boyd and Fulk (1996) showed that perceived uncertainty is generally related to environmental scanning, and Barringer and Bluedorn (1999) found that scanning is a method of uncertainty absorption that can help managers cope with uncertainty. For instance, Stewart *et al.* (2008) show that entrepreneurs in India scan more frequently than entrepreneurs in the USA. They also report that Indians have a lower tolerance for risk than their American counterparts. Ebrahimi (2000a) found that Hong-Kong executives perceived high uncertainty and scanned the task environment intensely. Because societies with high uncertainty avoidance feel more threatened by uncertain and ambiguous situations (Hofstede, 1980), it is arguable that firms in these societies are more likely to perform internal and external environmental scanning. Hence:

H3a. The higher the uncertainty avoidance value of the national culture, the more firms will scan the external environment.

H3b. The higher the uncertainty avoidance value of the national culture, the more firms will scan the internal environment.

In high power distance societies, standards of behaviour do not encourage individual initiative or risk-taking, which can introduce uncertainty into the daily routine (Hofstede, 1983). As in a high uncertainty avoidance cultures, there is likely to be more scanning activity in high power distance cultures. Hence:

H4a. The higher the power distance value of the national culture, the more firms will scan the external environment.

H4b. The higher the power distance value of the national culture, the more firms will scan the internal environment.

Environmental scanning: a step in the strategic planning process. Both scanning and environmental analysis play crucial support roles in the strategic planning process (Fahey and Narayanan, 1986). It has also been shown that national culture influences the strategy planning process (Brock *et al.*, 2000). Specifically, strategic planning is consistent with collectivism (Flynn and Saladin, 2006). In collectivist societies, strategic planners prefer the environment to be analysable and under control of the organisation that is performing the analysis (Mukherji and Hurtado, 2001). In individualistic cultures, organizational performance is attributed more to executive

leadership than to effective strategic planning (Mukherji and Hurtado, 2001; Flynn and Saladin, 2006). Consequently, there could be less environmental scanning in individualistic than collectivist societies. Hence:

H5a. The lower the individualism value of the national culture, the more firms will scan the external environment.

H5b. The lower the individualism value of the national culture, the more firms will scan the internal environment.

The expected relationship between the variables is depicted in Figure 1.

3. Research methods

3.1 Data collection: context and sample

This study addresses the role of environmental scanning in the IP strategy of SMEs across cultures. Data were collected under a broader research project on business practices and intellectual property protection. The sample comprises independent biotechnology companies with fewer than 250 employees. Given that environmental scanning is primarily the purview of top executives (Hambrick, 1982), a questionnaire was sent to managers of the 627 small health biotechnology enterprises listed in the *BioScan* database. A total of 123 managers located in 40 different countries took part in the study (19.6 per cent response rate). We tested for non-response bias by comparing early and late respondents (Armstrong and Overton, 1977) and found no significant differences. We selected individual items for our measurement scales from the extant literature. We conducted pre-test interviews with a small group of managers from various companies before distributing the final version. Because data were gathered from a single respondent at each organization, the likelihood of common response bias was assessed using the Harman (1976) one-factor test. As no single factor accounted for most of the variance, common method variance is unlikely to be a serious problem. Table I presents the distribution of respondents by country.

3.2 Measurement

Environmental scanning. A scale based on the previous literature (Haley, 2000; Brown and Prescott, 2000; Rabino and Enayati, 1995) was developed to assess the firms and their employees' access to external information concerning intellectual property and competitor behaviour, and audit practices. Three items measure IP internal environmental scanning and four items measure IP external environmental scanning. We conducted an exploratory factor analysis followed by a varimax rotation of the seven items. This yielded a two-factor solution:

(1) IP external environmental scanning (ES); and

(2) IP internal environmental scanning (IS).

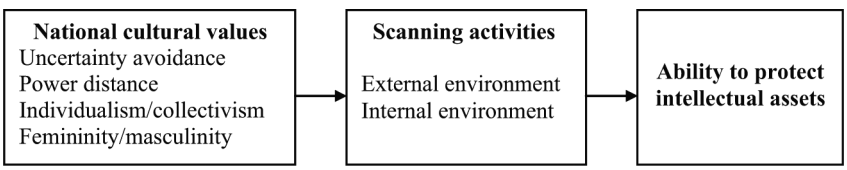

Figure 1.
Research model

Country	Number of surveys mailed	Number of responses	Percentage of responses	Response rate (%)
USA	255	33	26.83	12.94
Canada	86	19	15.45	22.09
Australia	25	10	8.13	40.00
Austria	4	0	0.00	0.00
Belgium	10	0	0.00	0.00
China	4	0	0.00	0.00
Denmark	21	3	2.44	14.29
Finland	8	3	2.44	37.50
France	35	13	10.57	37.14
Germany	47	6	4.88	12.77
Hungary	3	1	0.81	33.33
Ireland	3	0	0.00	0.00
Israel	7	0	0.00	0.00
Italy	5	2	1.63	40.00
Japan	12	0	0.00	0.00
The Netherlands	14	2	1.63	14.29
New Zealand	4	2	1.63	50.00
Norway	2	0	0.00	0.00
Romania	1	1	0.81	100.00
Singapore	3	0	0.00	0.00
Spain	11	6	4.88	54.55
Sweden	9	0	0.00	0.00
Switzerland	6	0	0.00	0.00
UK	52	22	17.89	42.31
Total	627	123	100.00	19.62

Table I.
Distribution of respondents by country

Taken together, these factors explained over 77 per cent of the variance in the data. As shown in Table I, all items loaded uniquely on one factor, except for one item that loaded on both the first and second factor, was subsequently excluded from the analysis (see Table II). The reliability of the scale is good ($\alpha = 0.69$ for external environmental scanning and $\alpha = 0.84$ for internal environmental scanning.

National cultural values. Four of the five cross-cultural value indices developed and validated by Hofstede (1980) – individualism/collectivism (IND), masculinity/femininity (MAS), power distance (PDI), and uncertainty avoidance (UAI) – were used to measure the cultural values of the countries studied. Hofstede's taxonomy and measurement were used instead of a subjective measurement because cultural values are societal phenomena and are most accurately captured at the society level (Geletkanycz, 1997). Nevertheless, other cultural taxonomies could prove equally useful in the study of organizational phenomena.

IP protection capacity. We used and adapted the two-item scales previously used in Kale *et al.*'s (2000) study (see Table III).

Control variables. Control variables were introduced in the regression model used to test the first hypotheses (*H1a* and *H1b*): firm size, patent strategy and secrecy. Intellectual property protection mechanisms can be grouped into two categories:

(1) *formal protection*, such as patents and other legal mechanisms; and

(2) *strategic protection*, such as secrecy (Harabi, 1995; Bőnte and Keilbach, 2005).

Item	Factor 1 (ES)	Factor 2 (IS)
1. We regularly survey the competition's patents and trademarks portfolio	0.943	0.046
2. We regularly survey our competitors' or other third parties' activities for potential patent infringement	0.926	0.104
3. We regularly survey the market to detect any infringement of patents	0.908	0.181
1. We periodically conduct intellectual property audits	0.032	0.862
2. We have created a strong database of all our IP	0.058	0.836
3. We have created a strong database of our licensing agreements	0.167	0.833
4. It is important to regularly update our intellectual property portfolio[a]	0.511	0.602
Eigenvalue	3.547	1.863
% of explained variance	50.67	26.61
Cronbach's alpha	0.930	0.818

Notes: [a] Factor loadings of 0.300 and higher are used to classify items across factors. Item 4 was excluded from the analysis. Items were measured using a five-point Likert scale with options ranging from 1 = "Strongly disagree" to 5 = "Strongly agree"

Table II.
Principal component analysis loadings for the IP environmental scanning construct

Items	Alpha	
Firm's IP protection capacity		
1. Our company is able to protect its core capabilities or skills		Kale *et al.* (2000)
2. Our company has been successful in protecting its assets from being appropriated by others		
Patent strategy		
1. It is preferable to accumulate related patents	0.700	Glasgow (2001)
2. We use legislative provisions and loopholes to apply for patent extensions		
Secrecy		
1. We maintain secrecy regarding product and process technology	0.803	Harabi (1995); Liebeskind (1997)
2. We use confidentiality clauses in all our contracts (clients, suppliers and partners)		
3. It is important to limit publicity about new inventions to a restricted circle until the patent application has been filed		

Table III.
Descriptions of the other constructs

A two-item scale based on Glasgow's (2001) was constructed to capture the firm's patenting behaviour (see Table III). Secrecy was measured using a three-item scale based on the literature (Hannah, 2005) (see Table III).

3.3 Analysis

Normality of variables was assessed using a Q-Q plot and the Kolmogorov-Smirnov test. Multiple regression models test *H1a* and *H1b*.

The assumption of normality for national cultural values was not satisfied. To investigate capacity to protect IP variation across cultures, cultural dimensions were dichotomized at theoretically meaningful points, based on Hofstede's (1980) analysis. Analysis of variance (ANOVA) was used to test hypotheses 2, 3, 4 and 5. ANOVA is used to examine the variation in means.

4. Results

Of the enterprises studied, 42 per cent are North American, 47 per cent are European and 10 per cent are in the Pacific zone (Australia and New Zealand). Average number of salaried employees is 30, with 31 per cent of enterprises having fewer than 20 employees and 5 per cent having over 150 employees.

Table IV shows the means, standard deviations and zero-order correlations between all variables.

H1a and *H1b* predict that environmental scanning will influence the capacity to protect core competences. As shown in Table V, these hypotheses are supported. Only control variables are introduced in Model 1, and Model 2 is the full model. External environmental scanning behaviour and audit activities comprise a phase in the strategic intellectual asset protection process that enhances the firm's capacity to protect its knowledge and competences.

H2a, *H2b*, *H3a*, *H3b*, *H4a* and *H4b* are supported, suggesting that in high uncertainty avoidance, high power distance and collectivism societies, there is more external and internal environmental scanning than in low uncertainty avoidance, low power distance and feminine societies (see Table VI).

According to *H4a* and *H4b*, scanning behaviour is more characteristic of masculine societies. These hypotheses are not supported, as scanning activity scores are higher in feminine societies. *H5a* and *H5b* suggest that there is more environmental scanning in collectivist than individualistic societies. These hypotheses are partially supported. The difference is significant only for external environmental scanning. Taken together, these results partially confirm the effect of national culture on scanning activity.

To better understand the effects of national cultural values on the firm's capacity to protect its intellectual assets, ANOVA analyses were performed to compare the variation in firms' protection capacity by national cultural dimension. Table VII presents the results, showing that the masculinity-femininity dimension does not affect the firm's ability to protect its intellectual assets; in individualism, low power distance and low uncertainty avoidance societies, scores on capacity to protect intellectual assets are higher than in collectivism, high power distance and high uncertainty avoidance societies.

5. Discussion and conclusion

This paper explored the role of cultural dimensions in firms' abilities to protect their intellectual assets, mainly through their impact on environmental scanning behaviour. Few studies have empirically analysed the role of environmental scanning in a particular domain, such as intellectual property strategic management. In addition, few studies have used a comparative cross-cultural approach.

Our results demonstrate that, on the whole, environmental scanning activity in the narrow and specialised scope of IP can be viewed as an intellectual asset protection mechanism. External and internal environmental scanning therefore appear to be important steps in intellectual property strategy. The results confirm previous findings that high performing companies scanned more broadly and frequently than their low performing counterparts (Daft *et al.*, 1988; Strandholm and Kumar, 2003). Our results show that the effect of environmental scanning on the firm's ability to protect its intellectual assets is more salient for internal scanning activity.

Nonetheless, some surprising findings were revealed. Firms located in high uncertainty avoidance, high power distance and low individualism societies did more

Table IV. Descriptive statistics and zero-order correlation constructs

	Means	S-D	1	2	3	4	5	6	7	8	9
IP protection capacity	7,59	1,31									
External environmental scanning	11,09	2,82	0.281**								
Internal environmental scanning	10,11	2,60	0.350**	0.234**							
UAI	50,90	15,84	−0.280**	0.391**	0.096						
PDI	40,62	11,71	−0.331**	0.228**	0.208*	0.858**					
ICI	82,43	10,12	0.158	−0.270**	0.003	−0.750**	−0.461**				
MFI	56,43	12,58	0.025	−0.304**	−0.165*	−0.363**	−0.231**	0.654**			
Firm size	1,33	,39	0.138	0.125	0.126	−0.146	0.060	0.245**	0.107		
Patent strategy	7,38	1,61	−0.002	0.085	0.307**	−0.002	0.062	−0.052	−0.178*	0.365**	
Secrecy	12,97	1,99	0.344**	0.204*	0.099	−0.390**	−0.444**	0.244**	0.255**	0.245**	0.110

Notes: * $p < 0.05$; ** $p < 0.01$. UAI = Unecrtainty Avoidance Index; PDI = Power Distance Index; ICI = Individualism-Collectivism Index; MFI = Masculinity-Femininity Index

scanning, while firms located in low uncertainty avoidance, low power distance and high individualism societies reported greater capacity to protect their intellectual assets.

These results question the role of environmental scanning in intellectual property strategy. Several explanations may be offered for this. For instance, external environmental scanning may also be explained by imitation behaviours and piracy. A collectivist culture emphasises and encourages learning by copying (Kshetri, 2008). Husted (1999) shows that software piracy rates are higher in collectivist societies. Marron and Steel (2000) found that piracy rates are higher in Indonesia and South Korea, both collectivist cultures. Indeed, much of the research argues that deviations from group norms are better tolerated by people in collectivist than individualist cultures (e.g. Triandis and Bhawuk, 1997). This may explain the higher capacity for intellectual asset protection in individualist societies and the important role of environmental scanning in collectivist societies. Environmental scanning may be favoured by uncertainty, that is, uncertainty is managed in order to better understand it (Schneider and De Meyer, 1991). Setting up mechanisms and practices designed to better protect competences and knowledge may give managers the illusion that they

Table V.
Standardized beta coefficients from the multiple regression analyses for *H1a* and *H1b*. Dependent variable: IP protection capacity

	Model 1	Model 2
External environmental scanning		0.152*
Internal environmental scanning		0.330**
Firm size	0.081	0.071
Patent strategy	0.068	0.173*
Secrecy	0.332	0.282**
Adjusted R^2	0.107	0.239
F	6.689**	9.958**

Notes: * $p < 0.05$, ** $p < 0.001$. Standardized regression coefficients. $n = 123$; The Durbin-Watson statistic for the different equations ranged from 1.99 to 2.09

Table VI.
External and internal environmental scanning by national cultural value

		External environmental scanning[a]		Internal environmental scanning[a]	
Uncertainty avoidance	Low uncertainty avoidance	10.74	(2.94)	14.07	(3.20)
	High uncertainty avoidance	12.27	(1.81)	15.61	(1.52)
	F	6.526*		6.441*	
Power distance	Low power distance	10.73	(2.92)	14.07	(3.17)
	High power distance	12.41	(1.75)	15.74	(1.51)
	F	7.442*		6.996*	
Individualism/collectivism	Collectivism	12.35	(1.44)	13.77	(3.47)
	Individualism	10.63	(3.06)	14.57	(2.82)
	F	11.029**		2.476 (n.s.)	
Femininity/masculinity	Feminine	12.02	(1.83)	15.42	(3.09)
	Masculine	10.47	(3.18)	13.65	(3.18)
	F	11.511**		12.143**	

Notes: [a] Means (sd). * $p < 0.01$; ** $p < 0.001$

		Capacity to protect intellectual assets[a]	
Uncertainty avoidance	Low uncertainty avoidance	7.75	(1.27)
	High uncertainty avoidance	6.82	(1.25)
	F	10.882*	
Power distance	Low power distance	7.75	(1.26)
	High power distance	6.79	(1.28)
	F	11.417*	
Individualism/collectivism	Collectivism	6.94	(1.07)
	Individualism	7.81	(1.31)
	F	12.980*	
Femininity/masculinity	Feminine	7.47	(1.67)
	Masculine	7.66	(1.01)
	F	0.742 (n.s.)	

Notes: [a] Means (sd). * $p < 0.001$

Table VII. Firms' capacity to protect IP by national cultural value

are better protected. Another line of reasoning leads to the conclusion that firms in low power distance, low uncertainty avoidance and individualism cultures have other protection mechanisms at their disposal. Scanning as a potential IP protection mechanism is practiced more in high uncertainty avoidance and high power distance societies. In low uncertainty avoidance and low power distance societies, scanning is used less, although these societies also show good IP protection. Therefore, other mechanisms may be involved.

Our results also confirm that patent strategy and secrecy are intellectual asset protection mechanisms.

Although the study makes a useful contribution to the strategy literature, several potential limitations should be noted. First, cross-sectional data is used, which provides limited insight into temporal aspects of dynamic environment. Second, the sample was restricted to a group of small biotechnology firms located in Western countries. Individualism prevails in developed and Western countries, whereas collectivism prevails in less developed and Eastern countries. Third, although English is the international language, particularly in the biotechnology sector, the questionnaires should be translated into the managers' national languages.

Nevertheless, this study has implications for practitioners. It demonstrates that, in international working relations, cultural values directly affect environmental scanning practices, and hence indirectly affect intellectual property protection capability. Given the strategic importance for innovative firms of scanning and IP, the results can help managers in the strategic decision-making process, specifically when internationalised R&D through decentralization or partnership is involved.

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