

Innovation Culture in French Organisations

Muriel Davies, Michel Moulinet and Stéphanie Buisine

CESI, LINEACT, Nanterre, France

mdavies@cesi.fr

sbuisine@cesi.fr

Abstract: The aim of this study was to measure the relative impact of culture and processes on innovation performance. Contrary to processes, culture represents all implicit factors influencing daily behaviour. Culture gathers the unwritten rules of the social game and serves as social cement for an organisation. Processes correspond to identified and formalised practices and rules, including having a dedicated team or qualified collaborators for running product design and development, for example. Based on the scientific literature, we designed a survey to assess these three sides of innovation (culture, processes and performance). We analysed the answers of 432 French innovation managers in order to identify the predictors of Innovation performance. The whole model appears highly explanatory and shows that innovation culture holds a predictive power nearly four times as high as innovation processes. In particular, eagerness for radical change, which is not so common in French organizations, is the strongest predictor of innovation performance. Collective discovery skills and innovation climate were also good predictors of innovation performance, whereas risk aversion and tradition appear as marginal negative predictors. . These results are original because practitioners and researchers mainly produce guidelines focused on innovation processes, methods and tools as if they were the only drivers of innovation. However, the major challenge for stimulating innovation could be to understand the organization's culture and design processes that will be both congruent to the existing culture and likely to initiate a first step to cultural change, which remains long and uncertain.

Keywords: Innovation, organisational culture, innovation processes, innovation performance

1. The three dimensions of innovation in organisations

Innovation is considered as central to solve major problems of societies (e.g., social and demographic challenges, climate change). In the past, Innovation has contributed to progress (Noailles-Siméon, 2017) and nowadays it is still alleged to fuel society's transformation towards more wellbeing and more prosperity (OCDE, 2016). In the literature, there are many different approaches to innovation. One kind of approach can be found in the Oslo Manual (2018), which defines innovation as a result (a new or improved product or process made available to potential users). Another type of approach can be seen through the existing innovation assessment tools, which mix inputs, outcomes and process indicators to measure innovation performance (Edquist *et al.*, 2018; European Commission, 2018). Some authors also explain innovation through intangible factors, such as the psychological profile of their leader (Christensen, 2011). The concept of innovation is therefore polysemous in itself (Beylat and Tambourin, 2013; Battistelli, 2014).

We propose to model innovation through an analogy with the interactionist paradigm known as the Lewin equation (Lewin, 1936), which models human behaviour (B) as the result of interactions between personal characteristics (P) and situational features (S): $B = f(P,S)$. In our case, the target behaviour is innovation performance in the organization. The situational features may correspond to all observable innovation rules that were formalized as a process, or a framework to innovate. The personal characteristics, in the case of an organization, may refer to implicit cultural features influencing innovation. We therefore model innovation as follows:

Innovation performance = f(innovation culture, innovation process).

Both process and culture define how people act in firms, but they are fundamentally different. We consider that innovation process gathers rules that are explicit, and usually written. They correspond to identified and formalized practices and rules. Innovation processes include having a dedicated team or qualified collaborators for running product design and development, for example (Boly, Camargo and Morel, 2016). In contrast, culture gathers the unwritten rules of the social game (Hofstede, Hofstede and Minkov, 2010) and serves as social cement for the organization (Cameron and Quinn, 2011). Innovation culture refers to the rules that are implicit and seldom officially described, make innovative thinking natural within the organisation and encourages innovation activities at all levels of the organisation (Davies and Buisine, 2018).

1.1 Innovation culture

Innovation culture manifests itself through the significance of innovation all-over the organisation and the innovativeness of people and teams (Davies and Buisine, 2018, 2022). However, it is also embedded in the

national culture of the country where the organisation is located. Hofstede et al. (2010) point out that two cultural dimensions are linked to innovation: power distance and uncertainty of avoidance. In France, power distance and uncertainty of avoidance are both high. High power distance means that innovation is rather run top down, reserved for executives. High uncertainty avoidance means that rules and plans are needed and that novelty takes time to be accepted.

Significance of innovation appears altogether through the types of innovation usually promoted in the organization, the innovation strategy chosen and how the underlying risk is managed. Regarding types of innovation, the OECD used to consider four types of innovation: product, process, organisation, and commercialisation (OECD, 2005). Disruptive vs. incremental innovation, also called radical vs. progressive innovation (OECD, 2005), is another innovation typology. Innovative companies promote disruptive innovation and also prove to be able to take smart risks (Christensen, 2011). In contrast, incremental innovation is likely to be non-discriminatory, as a manager cannot reasonably hinder improvement of existing products or processes, but non-innovation related to maintaining tradition should be more representative of a culture refraining innovation.

Innovation strategies are usually summarized into three main approaches: Technology Driver, Market Reader and Need Seeker (Jaruzelski, Staack and Goehle, 2014). The most common strategy in France is the former, and in the Silicon Valley it is the latter (Péladeau *et al.*, 2013). Hwang and Horowitz (2012) take Silicon Valley as innovation ecosystem reference and compare it with the Amazonian forest. Using this metaphor, they explain that innovation would occur preferentially in flourishing contexts, rich in interactions, and would often emerge from "weeds" that develop spontaneously without having been expected or encouraged. This image contrasts with that of the field (planted with "seeds"), with a well-defined process, everything all lined up, in which weeds are regularly eliminated. These images match with two contradictory philosophies underlying innovation, opposing large groups to start-ups (Guillemot *et al.*, 2016).

Most innovative companies concentrate innovative people and teams (Christensen, 2011; Barnhill, Smith and Oja, 2021). Innovative people have developed discovery skills at a high level: associating, observing, questioning, experimenting, and networking (Christensen, 2011). Among them, innovative leaders have specific achievements: they can be credited for having invented new products and being willing to change the world (Christensen, 2011). Beyond discovery skills, regulatory-focus is also predictive of innovation behaviours at the team level (Rietzschel, 2011). Promotion-oriented teams are seeking benefits aimed at an ideal. They are opposed to prevention-oriented teams, which focused on avoidance of losses. The former perform better on idea generation and diffusion than the latter (Rietzschel, 2011). Regulatory focus can be measured quite simply using proverbs (Faur, Martin and Clavel, 2017). In addition, to be innovative, a team needs to be preserved from competition, remain open to new ideas, and be able to challenge, trust, support and help one another (Amabile *et al.*, 1996).

1.2 Innovation process

Innovation processes are materialised in design, funding, human resources and networking activities (Amabile and Pratt, 2016; Boly, Camargo and Morel, 2016). For Guillemot *et al.* (2016), in large groups, innovation processes are rather positivistic, long, based on quality and competitiveness, and involving experts, among whom some are experts in innovation management (Amabile and Pratt, 2016). But all employees can also be involved (Garcia and de Paganow, 2013). In France, funding is a state action lever to support innovation, in particular through Tax Credit (Pisani-Ferry, Harfi and Lallemand, 2016; Aghion, Chanut and Jaravel, 2022). All these tangible features are part of what we call Innovation process in the present study.

1.3 Hypotheses

The aim of this paper is to capture and measure innovation culture in French organisations, and to assess its relative impact on innovation performance in comparison with innovation processes. Referring to our initial equation ($Innovation\ performance = f(Innovation\ Culture, Innovation\ Process)$) we set out two hypotheses :

H1: Innovation Culture is a predictor of Innovation Performance.

H2: Innovation Culture and Innovation Process are orthogonal dimensions.

To test these hypotheses, we ran a cross-industry section survey, as described in the following section.

2. Method

2.1 Sample

The survey was intended for decision-makers holding an overview of their organization's innovation practices. It was emailed to approximately 72,500 contacts, among which around 53,500 addresses were correct. We received 621 answers. After removing incomplete or duplicated data, we had a final sample of 432 respondents. We carried out a systematic review of the data using Société.com, LinkedIn, Google and corporate websites in order to categorise data into sectors and size of company as shown in Table 1.

Table 1: Companies represented in the survey by branches and employees.

Number of societies	Staffs					Total
	[0-10[[10-50[[50-250[[250-1000[[1000 et + [
Branches	[0-10[[10-50[[50-250[[250-1000[[1000 et + [Total
Others	5	2	6	7	11	31
Manufacturing industry	19	14	33	13	79	158
Construction	1		4	1	5	11
Trade, Transport, Accommodation and Catering	4	4	9	6	23	46
Information and Communication	17	21	9	4	9	60
Financial and insurance activities		2	1	3	13	19
Real Estate Activities	2		3		1	6
Specialized, Scientific and Technical Activities, Administrative and Support Services	37	23	14	8	19	101
Total	85	66	79	42	160	432

2.2 Material

In order to measure innovation performance, culture and process, we designed a questionnaire survey. It was intended for top-managers and had to be quite short, approximately 40 items to be evaluated using a Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Innovation performance was measured through a unique self-assessment item "We are a very innovative company" (item 22).

2.2.1 Measuring innovation culture

Table 2 presents the 27 items of the survey related to innovation culture. Items 1 to 4 deal with innovation types, two on the product, via disruption and tradition, and two on how to work, via the same concepts. Items 5 to 7 address innovation strategies (Techno-driver, Need-seeker and Market-reader). Items 8, 9, 10 and 35 deal with risk management. Therefore, 11 items deal with significance of innovation all-over the organisation. We also introduced 12 items dealing with innovative people and teams (items 15 to 20, 27 et 28, 37 to 40). Finally, items 23 to 26, addressing power distance and uncertainty avoidance and inspired by the VSM 2013 (Hofstede, Hofstede and Minkov, 2013), were included.

Table 2: Items related to innovation culture.

Topic	Sources	Items
Innovation types	(OCDE, 2005)	1. We are able to invent radically-new products or services.
		2. We offer long-standing optimised products or services.
		3. Sometimes we completely change the way we work.
		4. We are known for our traditional know-how.
Innovation strategy	(Péladeau <i>et al.</i> , 2013; Jaruzelski, Staack and Goehle, 2014)	5. Our strategy focuses on technological added value.
		6. Our strength is to know how to imagine new uses.
		7. We are fully listening to the requirements expressed by clients.
Risk	(Hwang and Horowitz, 2012; Guillemot <i>et al.</i> , 2016)	8. We are highly responsive to internal and external opportunities.
		9. We only launch a product when we are sure it will be a success, even if it means delaying its launch.
		10. In our business, we should make no error.
		35. Confidentiality is more important than communication.
Innovative people	(Christensen, 2011; Barnhill, Smith and Oja, 2021)	15. Most of our executives made significant contributions to new products or services.
		16. We are convinced that we will change the world.
		17. We are excellent administrators.
		18. All our collaborators have many ideas to contribute to organization, products or services evolutions.
		19. All our employees have the right and the duty to ask questions.
		20. Staff experiments new ideas every time it is possible.
Innovative team	(Amabile <i>et al.</i> , 1996; Rietzschel, 2011)	27. There is no competition between services.
		28. Employees are systematically supported in their initiative.
		37. Prevention is better than cure.
		38. Nothing is impossible to a willing heart.
		39. Nothing ventured, nothing gained.
		40. Better safe than sorry.
National culture	(Hofstede, Hofstede and Minkov, 2010, 2013)	23. Before taking any decision, we systematically consult each collaborator who could be impacted by it.
		24. An organisation structure in which some employees have two managers should be avoided at all cost.
		25. The future is a source of opportunity for us.
		26. One can be a good manager without having a precise answer to every question that a subordinate may raise about his or her work.

The 27 Innovation Culture items (1 to 10, 15 to 20, 23 to 28, 35, and 37 to 40) are also consistent with one other, with a Cronbach alpha of 0.812. They form a coherent dimension that we call Innovation Culture.

2.2.3 Measuring innovation process

Positivism of the innovation process is addressed in items 11 to 14. Items 13, 21 et 29 deal with human resources, and items 30 to 32 to innovation funding (see Table 3).

Table 3: Items related to innovation processes.

Topic	Sources	Items
Design processes	(Boly, 2008; Guillemot et al., 2016)	11. The innovation circuit is clearly identified in terms of choices and decision-making.
		12. Our innovation projects are managed in a linear or even sequential logic.
		14. We set up indicators to measure performance of our innovation processes.
Human resources	(Amabile et al., 2016)	13. We easily identify people with the expertise sought on important topics of the moment.
		29. At least one individual have recognised expertise in innovation management.
		21. We regularly engage all employees on innovation topics.
Innovation funding	(Pisani-Ferry et al., 2016; Aghion et al., 2022)	30. Without external funding, we would not be able to innovate.
		31. We always find a way to fund the projects we care about.
		32. We receive government subsidies or tax credits for our innovation projects.
Network and competitors		33. We belong in promising networks.
		34. We systematically consult our networks to develop our future products or services.
		36. We clearly know our position compared to companies that innovate in our field.

Items related to Innovation Process (11, 12, 13, 14, 21, 29, 30, 31, 32, 33, 34, 36) aggregate with a Cronbach alpha of 0.772. They form a coherent dimension, that we call Innovation Process.

2.3 Procedure

The survey was circulated by email. It was introduced by the following text: "In this questionnaire we provide a list of statements about your company. For each of these, indicate your level of agreement by answering on a scale ranging from 1 (not at all) to 7 (totally). There is no right or wrong answer, only your opinion matters. We invite you to respond as spontaneously as possible. Thank you for your participation!". Data were collected using Sphinx, then transposed to Excel and analysed using SPSS21.

3. Results

3.1 Validation of the three sides of Innovation

To test the validity of our equation, we need a reliable measure of its three sides, namely Innovation performance, Innovation Culture, and Innovation Process. Innovation performance is assessed through unique item 22. Although its normality is not verified (KS (429) = 0.138; $p < 0.001$; SW (429) = 0.939; $p < 0.001$), the distribution of responses appears symmetrical, with a slight shift to the right (Figure 1). In particular, we observe that respondents used the entire scale, from 1 to 7. We therefore considered this item as a valid self-assessment of innovation behaviour and innovation performance.

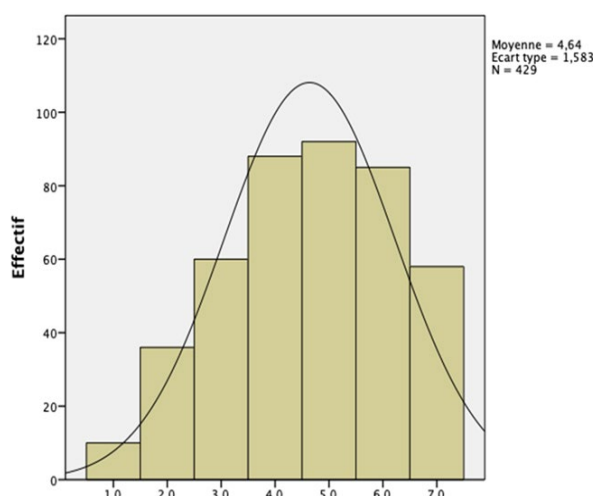


Figure 1: Distribution of ratings to item 22 "We are a very innovative company".

Innovation Process will be assessed through the aggregation of the 12 items listed in Table 3, which constitute a reliable dimension, as previously mentioned. Finally, as Innovation Culture is the main topic of this study, we decided to go a step further than the mere aggregation of Table 2 items and performed a Principal Component Analysis in order to identify potential subdimensions of innovation culture. Table 4 presents the results highlighting 8 such sub-dimensions.

Table 4: PCA results on Innovation Culture items.

Item	Innovation climate	Radical innovation	Risk aversion	Organizational optimism	Tradition	Collective discovery skills	Administration	Hierarchy
28_Innovative team	0,807	0,061	-0,07	0,139	0,016	0,1	0,093	0,138
27_Innovative team	0,778	0,08	-0,03	-0,013	-0,014	0,016	0,027	0,069
23_National culture	0,641	0,059	0,255	0,167	0,004	0,276	-0,172	0,016
15_Innovative people	0,607	0,165	0,244	0,09	-0,064	-0,01	-0,027	-0,183
8_Risk	0,557	0,245	-0,118	0,206	0,082	-0,083	0,5	0,109
19_Innovative people	0,514	0,093	-0,036	0,283	0,059	0,239	0,031	0,138
7_Innovation strategy	0,481	0,221	-0,101	0,097	0,224	-0,046	0,444	0,239
1_Innovation type	0,13	0,751	-0,022	0,066	-0,015	-0,184	-0,129	-0,012
5_Innovation strategy	0,087	0,72	0,143	0,092	0,031	-0,113	0,19	-0,221
6_Innovation strategy	0,213	0,654	-0,04	0,215	0,009	0,2	-0,105	0,137
3_Innovation type	0,172	0,535	-0,08	0,125	0,047	0,182	0,064	0,21
16_Innovative people	0,034	0,459	0,033	0,239	-0,148	0,391	0,014	-0,119
40_Innovative team	-0,071	0,022	0,72	-0,129	0,04	-0,047	-0,028	0,18
9_Risk	0,071	-0,004	0,655	-0,033	0,186	0,207	0,096	0,038
10_Risk	0,002	-0,038	0,642	-0,053	-0,037	-0,114	0,452	-0,065
37_Innovative team	0,162	-0,015	0,596	0,057	0,264	-0,138	-0,219	0,198
35_Risk	-0,121	0,332	0,341	-0,295	-0,101	0,007	0,338	0,179
38_Innovative team	0,129	0,052	-0,021	0,741	-0,177	0,112	0,128	0,202
25_National culture	0,136	0,32	0,009	0,66	0,125	0,107	0,089	-0,098
39_Innovative team	0,243	0,2	-0,188	0,623	0,032	0,04	-0,075	-0,019
2_Innovation type	0,051	0,106	0,144	0,012	0,823	-0,039	0	-0,072
4_Innovation type	-0,043	-0,109	0,131	-0,043	0,789	0,073	0,18	0,111
18_Innovative people	0,174	0,3	-0,008	0,029	0,061	0,753	0,051	-0,02
20_Innovative people	0,496	0,253	-0,05	0,151	-0,007	0,539	0,071	0,068
17_Innovative people	0,026	-0,215	0,198	0,145	0,283	0,274	0,611	0,023
24_National culture	0,106	-0,028	0,141	0,137	0,018	-0,135	-0,029	0,772
26_National culture	0,121	0,063	0,319	-0,118	0,023	0,22	0,201	0,602

Principal Component Analysis _ Varimax rotation with Kaiser normalization _ Converged after 18 iterations

The first dimension gathers seven items dealing with relationships and dialogue between stakeholders: managers with employees, teams with one another, organization with customers. Discussions rely on questioning and listening; leaders are innovative. The items come from various sources, but they all describe an atmosphere, a work environment conducive to innovation. We will call this dimension **Climate for innovation**.

The second dimension comprises five items, two of which dealing with disruptive innovation, relative to products and services (item 1) and organizational innovations (item 3). Two others relate to innovation strategies conducive to disruptive innovation: techno-push on the one hand (item 5) and need-seeking on the other hand (item 6). The last one (item 16) deals with a characteristic of innovative leader seeking disruption. These sources relate to definitions and practices of disruptive innovation. We will call this dimension **Radical Innovation**.

The third dimension brings together five items dealing with the need for control (item 9, 10, 35) and prevention motivational orientation (Rietzschel, 2011). Motivation, if directed towards prevention, seeks to avoid losses, instead of gaining profits. We call this dimension **Risk Aversion**.

The fourth dimension is composed of three items, two of them related to a promotion motivational orientation (Rietzschel, 2011), the third one to a low uncertainty avoidance index (Hofstede et al., 2010). We call this dimension **Organisational optimism**, by analogy to the optimistic person considering that life brings positive events (Seligman, 2011; Gangloff and Malleh, 2017).

The fifth dimension consists of two items dealing with traditional and mastered know-how and products. We will call it **Tradition**. The sixth dimension contains 2 items related to discovery skills shared by individuals, hence the name **Collective discovery skills**. The seventh dimension has only one item, which we will call **Administration**, and the eighth dimension consists of an item related to power distance, and an item related to the control of uncertainty, both related to the role of the hierarchical manager. We call this dimension **Hierarchy**.

Finally, we checked the reliability of each of these subdimensions, as summarized in Table 5. The Hierarchy subdimension, which appears insufficiently reliable, was removed from further analysis.

Table 5: Reliability of Innovation dimensions.

Innovation sides		Cronbach's Alpha
Innovation performance		Single item
Innovation process		$\alpha = 0,772$
Innovation Culture	Dimension 1	Climate for innovation $\alpha = 0,800$
	Dimension 2	Radical Innovation $\alpha = 0,755$
	Dimension 3	Risk aversion $\alpha = 0,649$
	Dimension 4	Organizational optimism $\alpha = 0,630$
	Dimension 5	Tradition $\alpha = 0,662$
	Dimension 6	Collective discovery skills $\alpha = 0,687$
	Dimension 7	Management Single item
	Dimension 8	Hierarchy $\alpha = 0,524$

3.2 Test of H1

To test H1, we performed a multiple regression analysis with Innovation Performance as Dependent Variable, Innovation Process and all subdimensions of Innovation Culture as predictors. The results (see Table 6) highlight four significant positive predictors: Innovation Process, Innovation Climate, Radical Innovation and Collective Discovery Skills. Two marginal negative predictors also arise: Risk Aversion and Tradition. Organizational Optimism and Administration do not predict innovation performance. The whole model has an explanatory power of $R^2 = 0,644$.

The sum of absolute values of standardized coefficients (Beta) for significant and marginal subdimensions of Innovation Culture amounts to 0,871, which is nearly four times as high as the predictive power of Innovation Processes (0,226). Hypothesis H1 is largely validated.

Table 6: Regression analysis with Innovation Performance as Dependent Variable.

Model	A	Beta	t	Signification
Constant	-1,706			
Innovation Process		0,226	5,719	$p < 0,001$
Innovation Climate		0,144	3,904	$p < 0,001$
Radical Innovation		0,454	11,584	$p < 0,001$
Risk Aversion		-0,054	-1,678	$p = 0,094$
Organizational optimism		0,023	0,648	$p = 0,518$
Tradition		-0,057	-1,829	$p = 0,068$
Collective Discovery Skills		0,162	4,267	$p < 0,001$
Administration		-0,03	-0,95	$p = 0,343$
Dependent Variable: Innovation Performance				

3.3 Test of H2

To test H2, we created a composite index of Innovation Culture based on the regression results (Innovation Culture = $0,144 \times$ Innovation Climate + $0,454 \times$ Radical Innovation – $0,054 \times$ Risk Aversion – $0,057 \times$ Tradition + $0,162 \times$ Collective Discovery Skills) as well as a weighted index of Innovation Process (with a 0,226 weight). We

computed the linear correlation between these indices, which proved positive and significant ($r = 0.590$; $p < 0.001$), as can also be seen on Figure 2. Hence Hypothesis H2 should be rejected.

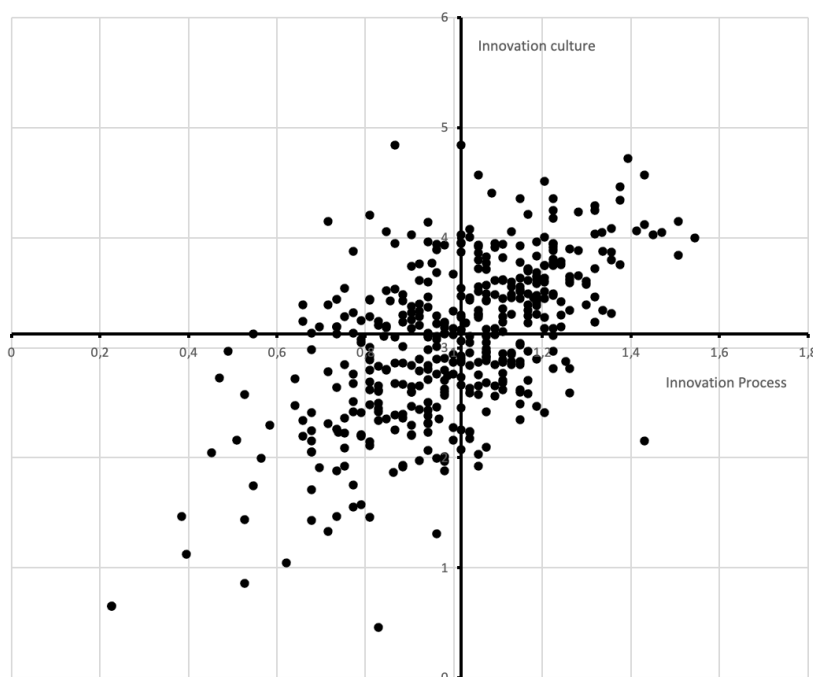


Figure 2: Scatterplot of Innovation Culture and Innovation Process indices for our respondents.

4. Discussion

The aim of this study was to try and measure the impact of cultural traits of organizations on their innovation performance and to assess the relative impact of such implicit invisible factors with regard to the impact of formal innovation processes. The whole study was built on an analogy between Lewin's equation of individual psychology and the innovation equation of a company. This analogy in itself may be insightful for managers and practitioners to understand what organizational culture is: culture may act as the personality of the company and influence the behaviour of its members outside of their awareness and willingness. This may explain why innovation is natural in some companies and painful in others, why innovation processes sometimes fail and why innovation sometimes flourishes without a clear process, without explicit efforts or investments.

To demonstrate the role of innovation culture, we had to find a way to measure it, show its impact on innovation performance (Hypothesis H1) and show that innovation culture was independent from innovation processes (Hypothesis H2). We designed a questionnaire based on scholarly literature and performed a cross-industrial survey in France. The responses of a qualified sample of 432 executives were analysed and highlighted a few original results.

Regarding innovation performance, during this first step we did not have access to an objective measure, and had to rely on self-assessed innovation performance in French executives. We had anticipated a bias in our data in the form of a ceiling effect, as it might be tempting to declare one's company as highly innovative. Because the distribution was slightly shifted rightwards, we may consider that respondents tended to overestimate the real innovativeness of their organization. However, we should mention that the whole scale was used, including the lowest innovation score, which we consider positive and indicative of the honesty of our respondents and of the quality of our data.

Another interesting set of results concerns the subdimensions of organizational and innovation culture. Our analyses highlighted 8 clusters in the cultural data collected, among which 5 may play a significant or marginal role on innovation. The first two subdimensions, namely Innovation climate and Radical innovation, are particularly interesting. Innovation climate refers to a healthy but rather passive attitude towards innovation: openness but limited proactiveness, resulting in incremental innovation and progressive improvement. In contrast, Radical innovation promotes a riskier approach, far from being frightened by disruptive change, and eventually stimulating it. These two dimensions illustrate the innovator's dilemma as theorised by Christensen

(2011): willingness to develop participatory innovation responding as closely as possible to customers' demands (here: Innovation climate) may interfere with the development of disruptive ideas (here: Radical innovation). Innovation climate correlates with uncertainty avoidance (item 23 in our survey), which is a notable characteristic of French culture and may further contribute to inhibit radical innovation. However, our regression analysis shows that Radical innovation is the first predictor of innovation performance in our sample of French companies. This result illustrates the tension, sometimes up to a double bind, that French companies may experience when developing innovation projects while stressed to secure the business.

The second cultural predictor of innovation performance is what we called Collective discovery skills, in particular individual creativity and experimental spirit. This dimension may be enhanced through acceptance, acknowledgment, or recruitment of creative people in the organization, despite their tendency to be a bit less submissive and a bit more difficult to manage. Similarly, stimulating an experimental mind may appear as a source of risk and distraction from an organizational viewpoint, although they remain useful sources of innovation.

Although insightful, our study holds several limitations which draw avenues for future research: firstly, we are currently in the process of crossing our data with econometric measures of innovation such as the Community Innovation Survey data collected in European Union member states. The subsequent round of analyses will enable us to perform a new test of hypothesis H1 and compare the results with this first study. It will also offer the opportunity to analyse the relations between declarative and objectified data on innovation performance. A second limitation, inherent to cross-industrial surveys, is that we had only one respondent per firm in our sample. Hence a highly valuable perspective would be to collect the perception of innovation culture, processes (and performance) from a panel of employees from each company, study the consistency of their perception, and consolidate current data to deepen our analyses.

All in all, our results on the drivers of innovation performance are original as they emphasize the unexpected weight of culture with regard to formal processes. Although scholarly literature and consulting activity mainly focus on recommendations and interventions for structuring innovation processes, our findings stress the need for further studies regarding the mechanisms of organizational culture. However, contrary to our hypothesis, innovation culture and innovation process are not orthogonal dimensions of the organisational life. This means that companies holding an innovative culture are more likely to exhibit structured innovation processes. Likewise, the implementation of innovation process may shine a light on the innovative side of the company's culture and contribute to develop it. Anyhow, to develop innovation, culture and processes should be addressed alongside: when innovation processes require to be formalised, this should be compliant to the existing culture to be effective and efficient. Likewise, if culture would gain to increase its innovativeness, this evolution could be supported by the introduction of new practices through innovation processes. Here the key to success would rely on the design of a commitment process. Even if cultural transformation is always a long and uncertain challenge, this may appear as necessary to increase innovation, and more widely to adapt to a changing world.

Acknowledgments

This study was supported by France Stratégie and Ayming. The authors particularly thank Vincent Aussiloux, Haithem Ben Hassine, and Rémi Lallement from France Stratégie as well as Fabienne Brutin from Ayming.

References

- Aghion, P., Chanut, N. and Jaravel, X. (2022) 'Renforcer l'impact du Credit d'impot recherche'.
- Amabile, T. *et al.* (1996) 'Assessing the work environment for creativity', *Academy of management journal*, 39(5), pp. 1154–1184.
- Amabile, T. and Pratt, M. (2016) 'The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning', *Research in Organizational Behavior*, 36, pp. 157–183. Available at: <https://doi.org/10.1016/j.riob.2016.10.001>.
- Barnhill, C.R., Smith, N.L. and Oja, B.D. (2021) 'Creative and innovative teams', in *Organizational behavior in sport management*. Springer, pp. 165–173.
- Battistelli, A. (2014) 'La recherche psychosociale sur le processus d'innovation individuelle et d'équipe: un bilan des connaissances', *The psychosocial research in individual and team innovation process: a literature review (English)*, 20, pp. 336–352. Available at: [https://doi.org/10.1016/S1420-2530\(16\)30021-8](https://doi.org/10.1016/S1420-2530(16)30021-8).
- Beylat, J.-L. and Tambourin, P. (2013) *L'innovation: un enjeu majeur pour la France, dynamiser la croissance des entreprises innovantes*. Paris: Ministère du Redressement Productif & Ministère de l'Enseignement Supérieur et de la Recherche.

- Boly, V. (2008) *Ingénierie de l'innovation : organisation et méthodologies des entreprises innovantes* (1 vol). 2e éd. revue et augmentée. Paris: Hermès science publications-Lavoisier.
- Boly, V., Camargo, M. and Morel, L. (2016) *Ingénierie de l'innovation* (1 vol). 3e éd. Paris: Lavoisier-Hermès.
- Cameron, K.S. and Quinn, R.E. (2011) *Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework*. 3e édition. Jossey-Bass.
- Christensen, C. (2011) *The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business*. Reprint edition. HarperBusiness.
- Davies, M. and Buisine, S. (2018) 'Innovation culture in Organizations', in *Science, technology and Innovation Culture*. ISTE-Wiley (Innovation in engineering and technology set), pp. 101–115.
- Davies, M. and Buisine, S. (2022) 'Modelling and Measuring Innovation Culture', in *18th European Conference on Management Leadership and Governance*, Lisbonne: ACI.
- Edquist, C. et al. (2018) 'On the meaning of innovation performance: Is the synthetic indicator of the Innovation Union Scoreboard flawed?', *Research Evaluation*, 27(3), pp. 196–211. Available at: <https://doi.org/10.1093/reseval/rvy011>.
- European Commission (2018) *European Innovation Scoreboard 2018 - Main Report*. Luxembourg: European Union. Available at: <https://ec.europa.eu/docsroom/documents/30281>.
- Faur, C., Martin, J.-C. and Clavel, C. (2017) 'Measuring chronic regulatory focus with proverbs: The developmental and psychometric properties of a French scale', *Personality and Individual Differences*, 107, pp. 137–145.
- Gangloff, B. and Malleh, N. (2017) 'L'optimisme comme norme organisationnelle', *Psychologie du Travail et des Organisations*, 23(3), pp. 197–211. Available at: <https://doi.org/10.1016/j.pto.2017.05.001>.
- Garcia, M. and de Peganow, N. (2013) *Innovation participative. Remettre l'humain au coeur de l'entreprise*. Scrineo.
- Guillemot, G. et al. (2016) *Les Innovations créatrices d'emplois industriels*. Institut de la Réindustrialisation. Paris.
- Hofstede, G., Hofstede, G.J. and Minkov, M. (2010) *Cultures and Organizations: Software of the Mind, Third Edition*. 3e édition. New York: McGraw-Hill Professional.
- Hofstede, G., Hofstede, G.J. and Minkov, M. (2013) 'Questionnaire VSM 2013'.
- Hwang, V.W. and Horowitz, G. (2012) *The Rainforest: The Secret to Building the Next Silicon Valley*. 1.02 edition. Regenwald.
- Jaruzelski, B., Staack, V. and Goehle, B. (2014) 'Proven paths to innovation success', *Strategy + Business* [Preprint].
- Lewin, K. (1936) *Principles of Topological Psychology*. New-York: McGraw-Hill.
- Noailles-Siméon, P. (2017) 'L'innovation déflationniste', *La Revue des Sciences de Gestion*, (5), p. 23. Available at: <https://doi.org/10.3917/rsg.281.0023>.
- OCDE (2005) *Manuel d'Oslo*. Available at: https://www.oecd-ilibrary.org/fr/science-and-technology/manuel-d-oslo_9789264013124-fr (Accessed: 11 April 2018).
- OCDE (2016) *L'impératif d'innovation : Contribuer à la productivité, à la croissance et au bien-être*. Paris: Éditions OCDE. Available at: <https://doi.org/10.1787/9789264251540-fr>.
- OECD (2018) *Oslo Manual 2018 - Guidelines for Collecting, Reporting and Using Data on Innovation*. 4th edn. OECD Publishing, Paris/Eurostat, Luxembourg. Available at: <https://doi.org/10.1787/9789264304604-en> (Accessed: 7 January 2019).
- Péladeau, P. et al. (2013) *L'innovation dans les entreprises en France*. Paris: Booz & Company Inc.
- Pisani-Ferry, J., Harfi, M. and Lallemand, R. (2016) *Quinze ans de politiques d'innovation en France*. Paris: Commission Nationale d'Évaluation des Politiques d'Innovation. Available at: <http://www.strategie.gouv.fr/publications/quinze-ans-de-politiques-dinnovation-france> (Accessed: 9 April 2018).
- Rietzschel, E.F. (2011) 'Collective regulatory focus predicts specific aspects of team innovation', *Group Processes & Intergroup Relations*, 14(3), pp. 337–345. Available at: <https://doi.org/10.1177/1368430210392396>.
- Seligman, M.E.P. (2011) *Flourish: A Visionary New Understanding of Happiness and Well-Being*. New York: Free Pr.