

# Facilitating radical innovation through secret technology-oriented skunkworks projects: Implications for human resource practices

Victor Oltra<sup>1</sup>  | Carole Donada<sup>2</sup> | Joaquin Alegre<sup>1</sup>

<sup>1</sup>Department of Business Management, University of Valencia, Valencia, Spain

<sup>2</sup>ESSEC Business School, Cergy, France

## Correspondence

Victor Oltra, Department of Business Management, Facultat d'Economia, University of Valencia, Av. Tarongers, s/n, 46022 Valencia, Spain.  
Email: [victor.oltra@uv.es](mailto:victor.oltra@uv.es)

## Abstract

Technology-oriented skunkworks projects aim at facilitating radical innovation through approaches different from 'normal' research and development processes and have their specific organisational challenges. Joint human resource management (HRM) and innovation management research on HRM requirements for technology-oriented skunkworks is so far scarce, revealing a timely research gap and propelling our research question: what are the human resources (HR) practices that best support secret technology-oriented skunkworks projects (compared to HR practices in innovation contexts)? An exploratory case study of a skunkworks project at PSA Peugeot-Citroën (currently Groupe PSA) reveals seven skunkworks-boosting HR practices: extreme empowerment and autonomy in job design and task development, extensive team-based training, creativity-based performance appraisal, participative decision-making systems, ultra-open job descriptions, 'undercover' (extremely discreet) recruitment and selection processes and turbulence-oriented employee flexibility. Managers responsible for technology-oriented skunkworks projects are offered guidance. Overall, our

**Abbreviations:** COVID, coronavirus disease; HR, human resources; HRM, human resource management; PO, parent organisation; PSA, Peugeot Citroën; R&D, research & development; SK, skunkworks; VUCA, volatile, uncertain, complex, and ambiguous.

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investigation enriches the promising research stream on skunkworks in action and their HR-related challenges, also opening further research opportunities on skunkworks managerial success conditions.

**KEYWORDS**

human resource practices, knowledge work, qualitative research, radical innovation, skunkworks projects

**Practitioner notes****What is currently known about the subject matter?**

- Traditional organisational structures do not facilitate radical innovation.
- Skunkworks projects can help overcome this problem.
- Skunkworks projects are based on highly autonomous teams.
- Skunkworks projects work 'secretly' outside organisational rules.

**What this study adds to this?**

- We reveal how relevant human resources (HR)-related dynamics operate in the context of a secret technology-oriented skunkworks project.
- We identify seven skunkworks-boosting HR practices for radical innovation.
- Our proposed HR practices go beyond mainstream innovation-friendly human resource management (HRM).

**Implications of the study findings for practitioners**

- Managers are offered new HRM practices to facilitate radical innovation.
- Managers must carefully monitor skunkworks (innovation) project dynamics.
- Managers must carefully tackle relevant skunkworks (post-project) challenges.

## 1 | INTRODUCTION

Nowadays, organisations are exposed to volatile, uncertain, complex, and ambiguous (VUCA) contexts requiring adaptation to significant changes (Schoemaker et al., 2018), such as new exigent environmental regulations or an unexpected COVID-19 pandemic situation. As a result, firms are forced to adapt by designing and implementing innovation projects with different degrees of radicality. Most firms do better in terms of incremental innovation than radical innovation (O'Connor & DeMartino, 2006). Incremental innovation is easily connected to extant organisational knowledge, current working procedures and business models within an organisation, while radical innovation requires more profound learning processes, more concentration and more distance with day-to-day operations (Obal et al., 2016). Intrapreneurship and agile structures can help overcome these problems, fostering organisational learning for radical innovation (Bessant et al., 2014; Hagen et al., 2014). However, when 'disruptive innovation' is to be achieved urgently, these structures may not be autonomous enough to speed up innovation cycles and bypass organisational inertia (Christensen et al., 2015; Larsson, 2019; Levinthal & March, 1993).

To tackle the above-mentioned situation, the Lockheed Martin company created the first 'skunkworks' in 1943. In response to the urgent need to quickly develop a US jet fighter in the midst of World War II, the aircraft manufacturer disrupted its own research & development (R&D) organisation by creating an isolated and secret satellite structure – subsequently called skunkworks: 43 engineers from the main organisation were selected to secretly operate with almost total autonomy and no managerial oversight to avoid bureaucratic delays to deliver a number of planes in times much faster than those required by the corporation in usual circumstances (Gwynne, 1997, p. 1).

Lockheed Martin's success gave birth to similar secret technology-oriented skunkworks projects and other skunkworks structures, identified as groups of technological experts and passionate intrapreneurs who are isolated from the rest of their business to urgently work on innovation for their organisation, with given resources and free from the parent's rules and regulations (Blank, 2014; Brown, 2004; Connor, 2017; Larsson, 2019). Following on Christensen et al. (2015), skunkworks correspond to disruptive innovation structures; that is, radically new and smaller structures with fewer resources able to successfully challenge the established ones. Even if some of the skunkworks features can be shared with other satellite structures to innovate (e.g., technological expert groups and passionate intrapreneurs, etc.), others might be specific to secret technology-oriented skunkworks projects (e.g., secrecy, urgency, etc.).

Because of their specificities, skunkworks projects would seem to benefit from specific human resource management (HRM) practices that focus on encouraging as much creativity as possible, as well as developing high levels of empowerment to deal with secret and time constraints, and fostering autonomous team working. While the strategic human resources (HR) literature has focused on the development of formal HR practices and systems as the primary structures through which routine organisational control is enacted (Snell, 1992), we know little about organising structures such as skunkworks. Interestingly, relevant calls have been made recently for focusing on radical innovation organisation in the HRM-innovation link (Seeck & Diehl, 2017). Furthermore, very recently a specific HR skunkworks framework emphasising the HR skunkworks process, characteristics, antecedents, moderators and outcomes has been put forward by Biron et al. (2021). This framework soundly underscores the current relevance of the skunkworks topic, especially in the context of the post COVID-19 extremely complex and rapidly changing business environment. Much research is needed to better understand skunkworks management in different organisational decision areas such as technology management (Bommer et al., 2002; Larsson, 2019), strategic management (Oliver & Cole, 2019) or HRM (Biron et al., 2021). Hence, the following research question is stated: *what are the HR practices that best support secret technology-oriented skunkworks projects (compared to HR practices in innovation contexts)?*

In order to tackle the above-mentioned question, this study examines the case of a *secret technology-oriented* skunkworks project ('Hybrid Air' engine radical technological development) at PSA Peugeot-Citroën (PSA), a leading multinational company in the automobile industry (currently Groupe PSA). This study describes this case and focuses on HR issues. Our main contribution in this study is our proposal of a number of HR practices particularly suited for supporting technology-oriented skunkworks projects: extreme empowerment and autonomy in job design and task development, extensive team-based training, creativity-based performance appraisal, participative decision-making systems, ultra-open job descriptions, 'undercover' (extremely discreet) recruitment and selection processes and turbulence-oriented employee flexibility.

## 2 | SKUNKWORKS PROJECTS AND INNOVATION-TRIGGERING HRM: LITERATURE REVIEW

In response to significant environmental changes derived from VUCA contexts, organisational structures in large established firms must find ways to develop radical innovations (Kelley et al., 2009; O'Connor & DeMartino, 2006; Schoemaker et al., 2018). Incremental innovations have been found to benefit from a formal and routinised structure, whereas an informal and flexible structure that is able to provide autonomy to employees is best for

supporting radical innovations. Organisational requirements for radical innovation are difficult to implement in mainstream organisations (Kelley et al., 2009; Menguc & Auh, 2010). For these reasons, Bessant et al. (2014) recommend using skunkworks by large established firms to deal with technological exploration and radical innovation.

As 'isolated habitat of innovative culture, where the innovators are isolated (physically and otherwise) from the rest of the organization' (Larsson, 2019, p. 45), skunkworks are opportunities to challenge and even disrupt established innovative organisations. More specifically, Gwynne (1997) defines technology-oriented skunkworks as 'small groups of scientists, engineers and other personnel who tackle specific problems and try to commercialize the solutions'. Brown (2004) underscores the presence of highly skilled, passionate, and creative intrapreneurs missioned to accelerate the R&D process of innovative products, services or business models. Fosfuri and Rønde (2009, p. 281) and Larsson (2019) insist on the autonomy, independency and freedom given to escape the established lines of thought. Single and Spurgeon (1996) mention the ability to work outside the bounds of the mainstream organisation's rules and procedures with the top management support in an extreme time pressure. Finally, Bommer et al. (2002) and Brown (2004), who offer a detailed analysis of the original Lockheed Martin's skunkworks, highlight secrecy as a key attribute. Although the structure of each secret technology-oriented skunkworks differs according to its objective, perimeter and funding, we can synthesise its main characteristics as follows: (1) a small team of creative experts oriented towards radical innovation, (2) autonomy and lack of formalisation, (3) top management direct sponsorship and protection, (4) urgency and (5) secrecy.

Considering the element of secrecy, ongoing secret technology-oriented skunkworks are almost impossible to observe: when they fail, researchers are not allowed to tell their story (taboo); when they succeed, they analyse their outcomes.

Authors point that execution is a key to success for skunkworks (Brown, 2004; Gwynne, 1997) – for example, regarding high creativity, autonomy needs versus actual empowerment given to people and teams. HR approaches that focus on the purpose of boosting employee creativity (Agarwal & Farndale, 2017; Binyamin & Carmeli, 2010; Tang et al., 2017), as well as organisational autonomy, clock speed, learning, agility and innovation within small, highly specific (R&D) teams including professionals, seems crucial to understand skunkworks functioning and key success factors (e.g., Bhattacharya & Wright, 2005; De Saá-Pérez & Díaz-Díaz, 2010; Ketkar & Sett, 2009, 2010; Seeck & Diehl, 2017).

This leads us to question ourselves about the connection between HR practices and secret skunkworks technological developments. This study aims at making a preliminary attempt to fill this gap.

Notwithstanding the above-mentioned literature limitations, basic theoretical underpinnings can be developed from the research connecting HRM with innovation performance (Chowhan, 2016; Curran & Walsworth, 2014; De Saá-Pérez & Díaz-Díaz, 2010; Park et al., 2019; Prieto & Pérez-Santana, 2014; Sanders et al., 2018; Shipton, Budhwar, Sparrow, & Brown, 2017; Shipton, Sparrow, Budhwar, & Brown, 2017), which is especially complex in the team context (Jørgensen & Becker, 2017). It is worthwhile to recall some relevant empirical studies on the HRM-innovation link (for recent reviews, see e.g., Bos-Nehles et al., 2017; Seeck & Diehl, 2017). Early research into this topic found 'sophisticated approaches' to recruitment and selection, induction, appraisal and training, in the context of a 'learning climate', to play an important role in the 'bundles' of HR practices (usually in the high-performance/high-commitment domain) predicting innovation outcomes (Shipton et al., 2005; Shipton, West, Dawson, et al., 2006). Moving towards more attitudinal aspects of HRM, that is, intermediate outcomes linking 'official' HR policies and organisational (innovation) performance, Shipton, West, Parkes, et al. (2006) posited aggregate job satisfaction as a significant predictor of organisational innovation. Combining the results of these contributions, it is logical to assume that, in innovation-intensive contexts, (knowledge) workers' (e.g., Aagaard, 2017; Swart, 2007) satisfaction will increase as a consequence of experiencing HR practices such as sophisticated recruitment and selection, induction, appraisal and training, combined with team working.

As a result of literature reviews mainly focused on (HRM-performance) contingent perspectives (e.g., Miles & Snow, 1984; Schuler & Jackson, 1987), further research was conducted on the suitability of those HR practices most likely to be appropriate for innovation-oriented (business) strategies. Jiménez-Jiménez and Sanz-Valle (2005) showed a positive link between innovation and an internally consistent system of Schuler and Jackson's (1987) HR practices aimed at innovation: external recruitment, high employment security, broad application of training, use of internal career paths, use of performance appraisal systems, incentive-based compensation and high employee participation. The innovation-triggering HRM system was subsequently refined – and positively tested – by the same authors (Jiménez-Jiménez & Sanz-Valle, 2008), comprising flexible job design and empowerment, team working, long-term and skill-oriented staffing, extensive and long-term-oriented training, broad career opportunities, behaviour-based appraisal and organic compensation system. Later on, deepening into compensation issues, Curran and Walsworth (2014) found no differences in employee innovation depending on fixed versus performance-based individual pay, whereas variable group pay and employee benefits positively influenced innovation performance. These results are consistent with those of Park and Kruse (2014), who found that the connection between group incentives and financial performance is stronger in highly innovative companies. More recently, Sanders et al. (2018), in a multi-country study, did not find a significant relationship between performance-based rewards and innovative behaviours; a result reinforced in high uncertainty-avoidance cultures and softened in companies where employees perceive stronger HR systems.

Furthermore, an increased innovation potential has been argued to be boosted by employee flexibility (Hansen et al., 2019), highly relevant to face environmental turbulence (Camps et al., 2016; Ketkar & Sett, 2010; Wright & Snell, 1998). Strategic alternatives that propel innovation can be generated by employees exhibiting skill and behaviour flexibility (Bhattacharya & Wright, 2005; Ketkar & Sett, 2010). Employee flexibility, defined as 'the extent to which employees possess skills and behavioural repertoires that can provide a firm with options to pursue strategic alternatives' (Beltrán-Martín & Roca-Puig, 2013, p. 648), helps tackle turbulent environments by improving the array of strategic choices (Bhattacharya & Wright, 2005; Pacheco-de-Almeida et al., 2008; Santos-Vijande et al., 2012). Diverse competitive demands can be met by flexible employees who can implement a variety of far-fetching strategies, beyond the needs that are immediately relevant to the firm (Camps et al., 2016; Wright & Snell, 1998).

Having in mind the above review on the HRM-innovation link and the five characteristics of secret technology-oriented skunkworks, it is theoretically possible to identify four challenges for HRM in (secret technology-oriented) skunkworks in action. First, issues such as team-based organisation, high autonomy, creativity and flexibility (e.g., Jørgensen & Becker, 2017; Ketkar & Sett, 2010) create an HRM challenge around *job/task design & development*. Second, the aspect of high autonomy of skunkworks teams (Larsson, 2019), and the fact that their members are highly skilled creative experts can be, more specifically, connected to the fact that such employees are expected to be highly empowered and, as highly qualified professionals, to have influential inputs in decision-making processes. Hence, we identify a second HRM challenge: *employee voice & power*. Third, as seen in our literature review, employee appraisal aspects, which are already tricky when it comes to boosting innovation in general (Curran & Walsworth, 2014; Park & Kruse, 2014; Shipton et al., 2005; Shipton, West, Dawson, et al., 2006), are expected to show particularly complex nuances when it comes to skunkworks dynamics – having in mind, for example, the features of urgency and secrecy. Therefore, not deepening any further at the moment, but opening another analytical pillar, we suggest a third HRM challenge around *employee appraisal*. Last, but not least, a fourth challenge is related to the specificities of recruitment and selection of employees who must contribute to innovation. Although the characteristics of people who are hired to work for skunkworks can fit the general needs of innovation-friendly behaviours and personality traits, such as, for example, risk-seeking attitude, creativity, open-mindedness, flexibility and so forth (Aagaard, 2017), the specificities of skunkworks (e.g., urgency and secrecy again) make us believe this can be a promising aspect well-worth to deepen into throughout case analysis. Thus, we suggest our fourth HRM challenge concerning *recruitment and selection*.

The four HRM challenges for skunkworks in action derived from our review of theoretical contributions in the HRM-innovation literature and research on skunkworks have, to our knowledge, never been empirically studied. Consequently, companies developing a skunkworks for the first time could not refer to prior report. In addition, researchers who refer to radical innovation structures cite technology-oriented skunkworks as sources of learning, but the few empirical case studies published so far do not allow them to provide detailed illustrations. It is therefore to fill these gaps that we choose an in-depth case study approach to identify the HR practices that best support technology-oriented skunkworks projects, considering the four HRM challenges introduced above.

### 3 | RESEARCH SETTING AND METHOD

This exploratory study relies on the single case study tradition (Yin, 2014) for several reasons. First, having in mind that our research question is novel, and the study of HRM in skunkworks is so far understudied by the extant literature, we were in the position described by K. Eisenhardt (in Gehman et al., 2018, p. 287) 'where researchers walk in the door and don't have a preconception of what relationships they're going to see'. Hence, designing an inductive approach was the appropriate option (Pratt, 2009; Pratt et al., 2019). Second, a case study focus investigates organisational phenomena in its own context and is appropriate to get rich insight about specific issues that need a careful attention to detail (Eisenhardt, 1989; Pratt et al., 2019). Third, case study analysis is also adequate for building frameworks related to complex or unknown underlying processes and for finding data patterns that can help shed light on the issue of interest (Gehman et al., 2018; Maxwell, 2013). Finally, we had a unique opportunity to access some collaborators of the distinctive skunkworks set by the French car manufacturer PSA. Due to their secret nature, it is almost impossible for researchers to identify ongoing skunkworks projects and even more to get ex-post information about their inside practices – old skunkworks outputs have already been examined in the automotive industry (e.g., Ford skunkworks by Single and Spurgeon, 1996 or BMW by Gloor & Coopeer, 2007). By chance, one of the researchers on this study has been academic director of a chair sponsored by PSA and always had direct contacts with some collaborators of the company and its supplier partners.

The case 'Hybrid Air': An innovative full-hybrid petrol solution for the car of the future' (corporate communication, 1 August 2016) was extremely relevant for three main reasons. First, Hybrid Air's outcome was acknowledged by automotive experts as a true radical innovation at both technical and process levels: 'A revolution (air)y innovation' headlined professional press releases. Second, Hybrid Air was a baptism of fire for PSA, which had never experimented skunkworks before. This fact was crucial for our research because it meant that the team project had to invent and experiment everything from scratch, including its way of managing people and organising their tasks. Finally, Hybrid Air had the profile of an 'extreme case' (Pratt, 2009) of skunkworks covering the five genuine characteristics.

Data collection started in February 2014, a year after the skunkworks disclosure, and was completed in September 2015, with the definitive end of the Hybrid Air project. First, we began by analysing secondary sources of information: press articles, specialist automobile blogs and YouTube videos. Because every innovation in the automotive industry is scrutinised by all, a large number of sources helped mitigate potential retrospective bias. Second, we interviewed eight Hybrid Air members who had worked in the skunkworks from its start: five PSA employees detached to Hybrid Air and three people from partner companies (Bosch and Faurecia) involved in the early phase of project. To ensure data validity, non-directive questioning was used by only asking Hybrid Air collaborators to focus on facts and periods, subsequently comparing the chronology of events (Eisenhardt, 1989). Third, we interviewed PSA but non-Hybrid Air collaborators, to achieve a more accurate understanding of the differences with the regular HR practices (mainly selection and local recruitment processes) in the main organisation for innovative projects: three people at the R&D department, one at the advanced marketing service and one in the HR department.<sup>1</sup>

Regarding the small number of interviews held after the project disclosure, it is important to understand that the skunkworks was a totally secret project unknown to everyone, except to the people involved (10 at the launch in 2010) and to the top executives validating PSA's innovation projects. Moreover, although the technical innovation resulting from the skunkworks was revealed a year before the start of our research (January 2013 was the official end of secret mode), only a few collaborators were allowed to talk about Hybrid Air, whose issues on industrial exploration were not yet fixed by the top management of the company. Consequently, we gathered data from additional primary sources by recording and note-taking speeches of Hybrid Air managers who could relay the content and history of the project in authorised professional conferences, research workshops and courses taught in engineering and business schools. When some information was lacking or needed verification, speakers were approached to talk to them at breaks of professional conferences, research workshops and classes. Using direct and recorded interviews allowed for triangulation of information to enhance trustworthiness of the research (Pratt et al., 2019).

All information was synthesised into a comprehensive document by highlighting correspondences emphasised by multiple sources. Data analysis was executed until the researchers reached 'an in-depth understanding of the phenomenon in question' (Denzin & Lincoln, 2000). Information was analysed through the lens of the four theoretical HRM challenges introduced at the end of the previous section, so as to elaborate a list of specific skunkworks-boosting HR practices for radical technology development (see the fifth section). The Appendix shows the structure of our analysis method.

## 4 | CASE STUDY ANALYSIS AND RESULTS

Hybrid Air skunkworks created a radical technology through a new way of organising project resources. It encompassed a radically new hybridisation engine technology combining a petrol engine, a compressed air energy storage unit, a hydraulic pump unit and an automatic transmission. It was also a new mode of management regarding the routines and regular processes in the firm. For the first time at PSA, a project was conducted in secret, within an isolated skunkworks structure, 30 km away from corporate headquarters. The initial team consisted of about 10 people but at the end, no less than 180 people were associated to that secret project. All collaborators were brought together in an autonomous cross-functional team managed for maximum agility. The project was directly sponsored by the Chairman of the board and the corporate R&D Director and benefited from a short and efficient decision-making process. In a record time, the team project developed, tested and optimised four generations of prototypes. For a large and bureaucratic industrial organisation such as PSA, the experience paved the way for new R&D and HRM practices.

### 4.1 | Skunkworks project background

After the 2008 crisis in the automobile industry, PSA faced difficult years with negative financial results. However, it was during this period that the car manufacturer decided to expand the range of its hybrid cars. Then, a small group of engineers from the department in charge of 'Engines and transmissions for the future' was given the task of conceptualising an urban and clean vehicle that would meet the European Union (2020) regulatory standards for CO<sub>2</sub> emissions. The head of the department at the time, Karim Mokkaem, took on a number of creative people from his team to make this mission a priority. When he realised how disruptive could be the challenge regarding the technical options taken by PSA, he thought that the only way to convince the decision-makers to pursue the research and allocate resources to the project was to present a prototype to the next Innovation Committee in June 2010. During that committee, both Philippe Varin (Chairman of the board) and Guillaume Faury (corporate R&D director and board member) saw the potential and gave their go-ahead despite the other members of the

committee who were firmly against continuing the project. *'I pay tribute to the visionary spirit of our leaders who said: "given what you obtain and given what you show, you must continue"' [R&D manager – Skunkworks (SK)].*

The go-ahead from the top management triggered the financing, the search for additional suitable resources and skills, assets and the whole process that would allow the technical exploration to continue. However, the corporate R&D director imposed a very strong time constraint to prepare for mass production, few autonomous resources and the obligation to keep total secrecy as in a skunkworks: *'At the end of the committee meeting, the project manager told us that we were a skunkworks project' [R&D manager – SK].*

## 4.2 | Skunkworks project development: Examining HR-related practices

The corporate R&D director supported the project for its radical and disruptive challenge, and he wanted to physically protect it from the main organisation regular processes. He had a past experience in the aviation industry; he knew how skunkworks could favour innovation by giving full autonomy and complete freedom to the people in charge of it: *'I believe in the project and I want to keep it secret, ... and I want to give time for teams to achieve it' [R&D director – Parent Organization (PO)].* Karim Mokkadem (just nominated as Hybrid Air project leader) and his colleagues never experienced a skunkworks approach. Like them, he was used to following hierarchical orders, respecting formal processes and routines, which meant a lot of control, reporting, long decision processes like those of large bureaucratic organisations.<sup>2</sup> For the skunkworks, he had to create a radically innovative technology but also design an adequate organisation, and the HR practices that go with it: *'There were many solutions that we could consider to address the constraints. But then it was important to "think outside the box" and not to repeat what the others [inside and outside PSA] had done because if we took the same specifications we would end up with the same result' [R&D engineer – SK].*

The first step was to form a team and Karim Mokkadem personally contacted a few people, from its own department, selected for their expertise but also for their ability to brainstorm: *'These were people [engineers] who had worked in the "Engines and Transmissions for the future" department and had brainstormed ideas that led to the simulation and presentation of the first prototype' [manager – PO].* The secret was well protected and the integration of these people into the skunkworks was easy. When additional skills were needed, it was prohibited to recruit people outside PSA for both financial and secrecy reasons. Building on the Chairman and the R&D director support for poaching the best in-house engineers, recognised unanimously within their field of expertise, Karim Mokkadem approached a manager he trusted to staff the project following a competencies plan, identify PSA collaborators, convince them to join the team and organise the all process.

For being unable to reveal the concept and its specifications, this manager had to be creative. Contacts with prospects did not go, as usual, through the HR department and *'Instead of communicating about the job, as is usually done, we had to communicate about those who already had contractually committed to involvement. We then had to take advantage of the effect of "word of mouth" which made it easier to co-opt new members. [...] We were in a state of secrecy and could not say anything about the project. It was simply good faith, trust and reputation that resulted in us getting people on board' [organization manager – SK].* When a collaborator accepted the deal, his/her supervisor learned of his/her transfer to another service (not specified) by a message from the top management: *'This is how Hybrid Air had the best people' [HR manager – PO].*

The secretive approach also required a specific labour contract. Interestingly, there was no such contract for skunkworks projects at PSA and it was not advisable to go through the corporate HR and legal department because of the secrecy. By the way, the Hybrid Air organisation manager prepared a document and each collaborator was asked to sign it: *'In fact, what we signed up for with Hybrid Air was nothing new compared to the terms of the employment contract that we had already signed when we arrived at PSA. It was mostly psychological. Many did not realize that the contract was the same as the one they had signed when they arrived at PSA' [organization manager – SK].* Finally, the basis



of the empowerment rooted in mutual trust between the recruits and the conviction that all of them were participating in an ambitious project.

Besides, in addition to the quality of the collaborators and the accuracy of the selection process which favoured an immediate empowerment, the team benefited from an innovative agile organisational structure: *'The particular feature of our organizational structure is that we dealt with everything at the same time and everyone was involved in everything based on their skills [...] In the automobile industry [and PSA], everyone is very compartmentalized and only covers their own profession or skills. There are a lot of different interfaces, which means time is wasted. It was the exact opposite in our project, and it was totally new' [engineer - SK].*

The first pillar of this organisational agility was an inside 'customer orientation' and a continuous solidarity with the others: *'We had lost our previous colleagues, but we had won a family' [engineer - SK].* The most striking effects of this 'family effect' were the speed with which challenges were addressed and the way complementary skills were interwoven. Solving short-term challenges was always the priority, but not only to meet project deadlines as it was the case in their prior service; it was first *'to extricate colleagues from difficult situations'*. In order to limit the stress caused by the urgency of the project and the secrecy issue limiting any external help, people stopped using the term 'problem' and favoured the term 'challenge', which they saw as more likely to stimulate collective behaviours. It was so essential to resolve the challenges that all collaborators who could take any actions that could help others always did so immediately, even if they were in the middle of working on other issues: *'We were all very responsive when it came to imponderables. [...] Some collaborators continued to work on the medium term, while others were 100% available as soon as a "problem" arose. We always made sure we kept that agility' [R&D manager - SK].*

With regard to the interweaving of complementary skills, in contrast to the traditional management approach in the company, where activities follow one another in a linear way based on predefined sequences, the management approach adopted in the skunkworks was based on the aggregation of all available skill sets in real time. Therefore, *'Everything was dealt with at the same time'*, as the project's head of technical aspects told us, which meant that challenges were neither separated nor compartmentalised but instead discussed at a group level. Analysing the schedule of a typical week clearly shows how these skills were interwoven, with technical problems addressed at the same time as those relating to industrialisation, design or after-sales services. The overall value chain could not be overlooked, and each person had to identify his contributions to several links in the chain. This approach was very innovative compared to usual practices: *'They all discovered that we could no longer work in silos' [HR manager - PO].*

The second pillar of the project's agility was the simplicity and robustness of the decision-making process. Thanks to the autonomy given to the project and the mutual trust that prevailed between the members, decision-making processes were disruptive. Unlike those of the central organisation, decisions were fast and always considered formal and definitive: *'The decision-making processes were immediate. In a normal project, you always have to go through each of your superiors, which slows the process down. [...] There were sometimes decisions that were difficult to make, but once they were made, they were explained and justified. By acting in that way, we maintained teams with high levels of solidarity, even though in some cases the proposal made by the person responsible for the particular skills concerned was not approved' [engineer - SK].* Additionally, all informants highlighted how they benefited from a unique and direct link to corporate management: *'There was no longer any hierarchy between Karim Mokkadem (Head of Hybrid Air) and Guillaume Faury (corporate R&D director), whereas usually they were separated by two levels' [engineer - PO]... 'We were lucky to be able to get around the hierarchy and get what we wanted to move forward quickly. [...] Decisions were made locally, at the level of each sub-team. Decisional AUTONOMY like that in a major group like PSA is something that only happens once in your career! [...] The kind of decisional autonomy we enjoyed is a dream!' [manager - SK].*

Finally, the absence of continuous monitoring was mentioned as a great benefit: *'Karim Mokkadem reported to Guillaume Faury, but Guillaume Faury did not monitor the decisions made or the continuity of the actions taken as part of the project' [manager - SK].* The construction of the team spirit and combination of good intentions cannot be seen independently of the supervisory approach adopted and the management structure based on trust: *'There wasn't really any formal supervision, but instead a kind of comprehensive self-supervision was put in place. Reports had to be concise, as we didn't want the teams spending their time writing reports for the decision-makers. [...] During the technical*

committee meeting on Monday afternoons, there was complete self-supervision and autonomous decisions. [...] Everyone was entitled to give their opinion, even if it wasn't their area of expertise, as we knew that could open new avenues. For example, the person officially in charge of software had already worked on perfecting solutions in the context of other missions. We consulted him and his advice proved crucial. These exchanges led to discussions and subsequently solutions. It was the different skills available that formed the basis for our supervision. [...] There was quite "phenomenal" cohesion, it was a real team. We did not control but trusted one another and developed a team spirit' [R&D engineer – SK].<sup>3</sup>

This complete freedom boosted creativity, and the results were striking: the firm had applied for more than 80 patents to protect its new technology. A prototype was presented every 6 months, whereas in the case of innovative projects managed using more traditional methods in other units, this timeframe varies from 1 year to 18 months: *'Presenting prototypes every six months was highly ambitious, as the usual time lapse between designing the parts, constructing the prototype and perfecting it is usually between 12 and 18 months. But we managed and our innovations were incredible' [engineer – PO].*

## 5 | DISCUSSION: IDENTIFYING SKUNKWORKS-BOOSTING HR PRACTICES FOR RADICAL TECHNOLOGY DEVELOPMENT

Combining our literature revision and the subsequent in-depth case study exploration, in this discussion, we aim at eventually deepening into our research question: 'what are the HR practices that best support secret technology-oriented skunkworks projects (compared to HR practices in innovation contexts)?' With this purpose, we analysed our data around two complementary aspects (see Appendix). On the one hand, the five key technology-oriented skunkworks characteristics identified at the beginning of the literature review: small team of creative experts oriented towards radical innovation, autonomy and lack of formalisation, top management direct sponsorship and protection, urgency and secrecy. On the other hand, the four preliminary (data analysis) categories, that is, the four HRM skunkworks challenges introduced at the end of the literature review: job/task design and development, employee voice and power, employee appraisal and recruitment and selection.

By navigating through the interviews and other data, we revealed more specific aspects related to the (above-mentioned) different technology-oriented skunkworks characteristics and HRM skunkworks challenges, eventually identifying seven skunkworks-boosting HR practices for radical technology development: extreme empowerment and autonomy in job design and task development, extensive team-based training, creativity-based performance appraisal, participative decision-making systems, ultra-open job descriptions, 'undercover' (extremely discreet) and fast recruitment and selection processes and turbulence-oriented employee flexibility. Now we proceed to explain each of such skunkworks-boosting HR practices.

*Extreme empowerment and autonomy in job design and task development.* Consistent with relevant studies in the extant literature on innovation-boosting HR practices (Beugelsdijk, 2008; Bos-Nehles et al., 2017; Černe et al., 2017; Foss & Laursen, 2005; Gupta & Singhal, 1993; Jiménez-Jiménez & Sanz-Valle, 2008), and particularly regarding research on self-managed R&D teams (Aagaard, 2017; Stoker et al., 2010), members of secret skunkworks projects need to be allowed to take risks, learn by trial and error and, generally speaking, be able to decide for themselves with lots of trust given by team leaders. Since goals and work processes are flexible and open, work dynamics cannot operate through strict directions and commands. Therefore, as observed in our case study, members of skunkworks projects are a specific type of knowledge workers that, beyond the requirements of 'regular' innovation dynamics, must be able to exercise extreme degrees of empowerment and autonomy at the workplace (Larsson, 2019). This is also consistent with the recent proposal by Shipton, Sparrow, Budhwar, and Brown (2017) of 'entrepreneurial' (vs. control-oriented) HRM, as a trigger of 'reflective innovation', by fostering 'employee opportunity and scope for extending cognitive parameters' and helping 'employees to experience opportunity in the workplace, especially as this relates to variety, challenge and growth' (Shipton, Sparrow, Budhwar, & Brown, 2017, p. 257).

*Extensive team-based training.* Specific and extensive training, crucial for effective (innovation-boosting) HRM (Bos-Nehles et al., 2017; Jerez-Gómez et al., 2004; Jiménez-Jiménez & Sanz-Valle, 2008; Shipton et al., 2005; Shipton, West, Dawson, et al., 2006), is particularly important for skunkworks projects, especially having in mind that the secrecy around such projects makes such endeavours something challenging for any newcomer. New team members need to be deeply acquainted with the project nature and goals, and also with its cross-functional composition and concurrent engineering style dynamics, essential for successful new product development (Zanko et al., 2008). Moreover, such training must be heavily team-focused: Team members need to be highly committed to the project and a positive team atmosphere should be triggered and maintained. High trust among team members and deep commitment are, as observed in our case study, features that would benefit from extensive team-based training and, within a radical innovation context, would fit skunkworks dynamics particularly well. Finally, learning how to deal with secrecy and urgency is compulsory, as revealed in our case study.

*Creativity-based performance appraisal.* Skunkworks project goals cannot be narrowly defined and must count on a high degree of openness and uncertainty. As evidenced in our case study, skunkworks members are expected to come up with out-of-the-box ideas and proposals, in line with the role of high creativity climates and behaviours in innovation-boosting (Gisbert-López et al., 2014; Speckbacher & Wabnegg, 2020) and high-performance (Agarwal & Farndale, 2017; Jiménez-Jiménez & Sanz-Valle, 2008; West et al., 2004) HR systems. The key role of creative ideas and the scarcity of pre-defined goals make performance criteria to rely heavily on creativity-based processes, behaviours and outcomes. Such a way of understanding 'performance-as-creativity', within a 'developmental appraisal' and approach (vs. old-fashioned reward/punishment views) can help refine how the concept of 'performance-based rewards' should be understood in extreme, stressful and fast innovation contexts such as skunkworks. Such a redefinition of 'performance-based rewards' is backed by recent research that shows that mainstream 'external reward' approaches are not helpful for boosting employee innovative behaviour (Sanders et al., 2018). Hence, innovation can only be properly incentivised by supporting behaviours that are considered effective for generating innovation outcomes (Speckbacher & Wabnegg, 2020) – such as creativity-based behaviours in skunkworks contexts. Furthermore, this is consistent with proposals for eventually enhancing employee creativity through a better structuring of HRM processes, thus reducing perceived uncertainty and stress at work and increasing psychological availability (Binyamin & Carmeli, 2010). Such employee psychological states – which help boost creativity – are, in turn, highly desirable in intrinsically uncertain, stressful and intrinsic motivation demanding work settings such as skunkworks. Therefore, in skunkworks, employee creativity should not become just an additional performance assessment criterion but an essential cornerstone of the employee appraisal system, especially in secrecy contexts where people can only count on themselves. However, careful (multilevel) design, implementation and monitoring of such appraisal systems are essential, in order to avoid falling into the (paradoxical) risk that knowledge behaviour-based appraisal ends up hindering innovation (cf. Andreeva et al., 2017).

*Participative decision-making systems,* especially regarding skunkworks project design and goals. Consistent with widespread emphasis on participation and empowerment in high-performance HR systems (Chiva & Alegre 2009; Jiménez-Jiménez & Sanz-Valle, 2005; Shipton et al., 2005; Shipton, West, Dawson, et al., 2006), skunkworks projects – as seen in our case study – rely heavily on highly committed individuals who have passion for their work and are willing to work long hours for the benefit of the project. Project members are also highly qualified knowledge workers who are experts in their domains, with whom a traditional command-and-control-based supervision cannot possibly work – let us remind the above-mentioned concept 'entrepreneurial' HRM (Shipton, Sparrow, Budhwar, & Brown, 2017). Therefore, skunkworks project employees, as a specific case of highly qualified and extremely committed project members, must be given a particularly high degree of voice in decision-making (Aagaard, 2017; Larsson, 2019), particularly regarding project design and goals. The latter point clearly differentiates skunkworks project requirements from mainstream, 'regular' innovation processes, as participation is not only necessary during project implementation but also necessary – and very especially – at the very initial stages of the design and goals setting of the diverse (sub)projects that autonomous project teams are expected to develop.

*Ultra-open job descriptions.* Open job descriptions are recommended under conditions of environmental turbulence and VUCA contexts, whereby organisations need to change and be flexible (Gómez-Mejía et al., 2012; Miles & Snow, 1984). Skunkworks projects not only meet these requirements, but – as seen in our case study – are also projects surrounded by secrecy and fed by high levels of creativity from project members. This means that jobs need to be particularly loosely designed, with even *ultra*-open descriptions – much more open than the ‘mainstream’ concept of broad job design that fits innovation strategies. Thus, the best out-of-the box ideas and decisions from employees may escape the domain of (even relatively loose) job descriptions, so extreme degrees of openness are needed when formally defining responsibilities, duties and tasks to be performed by skunkworks project members.

*‘Undercover’ (extremely discreet) recruitment and selection processes.* Similar to what happens with headhunting, our case study has evidenced that recruitment processes aimed at attracting candidates for skunkworks projects should be held with a great deal of discretion. However, also as seen in our case study, skunkworks project candidate recruitment differs from traditional headhunting at least in two aspects. First, the specific details on skunkworks assignments are unknown to a great extent to candidates themselves, at least until some degree of commitment has been achieved from the candidate to fill the position. In this sense, candidates are jumping into ‘unknown territory’. Showing a risk-taking attitude that is not usually seen in traditional headhunting processes. Second, once candidates are selected to fill skunkworks jobs, such appointments must be done with discretion, even secrecy, so the rest of the organisation from which candidates are drawn – let alone the ‘outside world’ – do not suspect what are the actual reasons for such employees to leave their previous positions at the company. Obviously, in traditional headhunting, once a top manager has been hired by a competitor, everybody knows about it, but this is not the case with skunkworks appointments. Hence, compared to recruitment and selection from a general innovation perspective, this practice, with its secrecy component, is – as observed in our case study – particularly specific to skunkworks contexts. Finally, our case study has also evidenced that having a lean and speed recruitment process is compulsory to both keep secrecy and respect the time constraints of the skunkworks.

*Turbulence-oriented employee flexibility.* Flexible employees can implement different strategies which are appropriate to diverse and changing competitive demands (Wright & Snell, 1998). Such an understanding of flexible workforce, also consistent with the above-mentioned ‘entrepreneurial HRM’ approaches (Shipton, Sparrow, Budhwar, & Brown, 2017), applies to skunkworks project member requirements. Hence, employee flexibility in a context of skunkworks projects should be sustained by the three dimensions that Camps et al. (2016) propose for dealing with turbulent environments and VUCA contexts. First, employee *polyvalence*, defined as the kind individual expertise which, in complex and dynamic environments, is related to higher levels of (knowledge) workers’ (meta) cognitive scope, ability and motivation to broaden the array of daily tasks/functions that they effectively carry out (Camps et al., 2016; Van der Heijde & Van der Heijden, 2006). Second, employee *adaptation* refers to individual receptivity to change and high understanding of how to take advantage of it (Van Der Heijde & Van Der Heijden, 2006), thus helping achieve and sustain competitive advantage in turbulent environments (Camps et al., 2016; Ketkar & Sett, 2010). Third, *anticipation* implies that employees, rather than focusing on their current breadth of competences, are able to detect new requirements and learn to perform new tasks quickly (Bhattacharya & Wright, 2005; Camps et al., 2016; Wright & Snell, 1998) – essential skills in skunkworks project contexts, highly shaped by turbulence (Ketkar & Sett, 2010) and knowledge-intensiveness (Aagaard, 2017; Starbuck, 1992; Swart & Kinnie, 2003; Yalabik et al., 2017), whereby (knowledge) workers are expected to actively contribute in shaping the (organisational) future (Fugate et al., 2004).

## 6 | CONCLUSION

This investigation has explored a case study of radical technological development (Hybrid Air) carried out through a secret technology-oriented skunkworks project implemented by a leading multinational company of the automobile industry (PSA). The aim of this study has been to propose a number of HR practices that seem especially important

to support proper development and success of secret technology-oriented skunkworks projects. These 'skunkworks-boosting' HR practices are extreme empowerment and autonomy in job design and task development, extensive team-based training, creativity-based performance appraisal, participative decision-making systems, ultra-open job descriptions, 'undercover' (extremely discreet) recruitment and selection processes and turbulence-oriented employee flexibility.

These practices have been implemented in our case study (Hybrid Air) to varying degrees. On the one hand, some of them (e.g., 'undercover' recruitment and selection) have been fully implemented and seem to be cornerstones of Hybrid Air project HR strategy, which provided direct evidence on the relevance of adopting such practices in skunkworks contexts. On the other hand, other practices (e.g., turbulence-oriented employee flexibility) have been proposed as a result of observing Hybrid Air skunkworks dynamics and assuming them to be highly consistent with the project needs. All in all, these practices offer guidance to managers in charge of skunkworks projects, in order to help them meet project goals.

These practices, although apparently quite similar to well-known HR practices aimed at facilitating 'regular' (radical) innovation projects, have some specific features that make them distinct and particularly applicable to secret skunkworks projects. Such specific features revolve around high secrecy (e.g., in recruitment and selection), especially deep trust (e.g., in job design and descriptions, employee flexibility) and – generally speaking – extreme 'out-of-the-box' implementation forms (e.g., in decision-making or performance appraisal).

Furthermore, the proposal of these 'skunkworks-boosting' HR practices represents a contribution to the new agenda on HR skunkworks recently opened by Biron et al. (2021) and Oliver and Cole (2019). While it is important to differentiate between technology-oriented and HR-oriented skunkworks since their goals and outcomes are totally different, we must also admit that both initiatives are intertwined. Any technology-oriented skunkworks, secret or not, requires making important HR decisions dealing with the small group of experts involved in the project. In our view, the HR practices proposed in this study provide a better understanding of the skunkworks HR process in the specific context of a secret skunkworks structure with a main outcome of radical technology development. Thus, our research also contributes to a better understanding of the skunkworks lifecycle (Oliver & Cole, 2019) as a process which is, to an important extent, driven by adapted HR practices.

Moreover, it is important to have a balanced view on all the outcomes of the Hybrid Air skunkworks project. Regarding technology, while the radical technological development undertaken in this project was a success in technical terms, its implementation on final products was problematic for efficiency issues. Regarding HR decisions, HR practices proved to be effective in achieving the skunkworks objectives, but there was a clear disconnection between the mainstream organisation and the employees in the skunkworks team (Biron et al., 2021). Because the Hybrid Air project was secret, this disconnection was severe. HR managers must be aware of this so that they can deal with the danger of misalignment between the mainstream and the skunkworks employees.

Although PSA did not implement more skunkworks initiatives after the Hybrid Air project, this study allows us to put forward some reflections on the wider outcomes of skunkworks in terms of (1) organisational capabilities and (2) employees. First, by using skunkworks, PSA carried out a radical technological development through a 2-years project. Even if Hybrid Air technology was not finally implemented because of efficiency problems, it clearly represents a major achievement for a large established firm. According to our data, PSA's skunkworks learned how to develop a radical technological breakthrough and thereby developed a radical innovation capability. This is an important finding for skunkworks and organisational capabilities literature (Bessant et al., 2014). Second, despite surprising initial arrangements such as working on a secret basis, skunkworkers proved to be creative and effective: They diligently put forward on-time a radical technological development. The secret skunkworks operations generated a new organisational context, emphasising creativity and problem-solving and understating norms and standardised procedures. Skunkworkers are clearly knowledge workers and as such they experience satisfaction when overcoming challenges. Once the Hybrid Air project was finished, skunkworkers were reluctant to go back to their old working positions. From an employees' point of view, skunkworks was positive for creativity, engagement and well-being. This is a relevant finding for skunkworks outcomes and HRM (Biron et al., 2021).

Lastly, a limitation of our study lies in its exploratory nature. Further studies are needed to refine our results in order to propose more consistent conceptual and analytical frameworks – which could be subject to subsequent exploration and testing. Our investigation also stimulates further questions for future research. Notably, a number of related problems, which appear to be intrinsically linked to skunkworks projects, deserve a deeper look through further research. First, due to their secret nature, it is impossible to study skunkworks in progress unless the researchers are notified in advance of the projects and are sponsored by the companies to study them. Hence, information is only collected after the disclosure and biased by the outcomes of the project and the memory of the informants. Second, the preferential treatment to the select few skunkworks project members is itself potentially a huge problem in the long run for any organisation (Brown, 2004), and especially for large multinational companies with high internal diversity – and therefore potentially increased perceptions of unfairness. Third, the problem of (post-project) reintegration of skunkworks members and products into the ‘regular’ organisation (Brown, 2004; Richardson, 2010) can also pose huge organisational challenges. Fourth, beyond the strict skunkworks project implementation success (e.g., in developing a prototype), proper full-fledged innovation fulfilment – understood as industrial/commercial new process/product success – was not achieved in our case study. For different reasons, these last issues were not dealt with effectively in the Hybrid Air skunkworks case; the project itself can be regarded a success, but a number of (mainly post-project) troublesome complications appeared. More precisely, an adequate focus on customers’ needs and employees’ retention and re-integration (Biron et al., 2021) was missing. Further research could shed new light on this.

Future studies on skunkworks could also examine how changes in external labour market and growing globalisation could affect the HRM practices that are implemented in the project. Furthermore, the consideration of skunkworks as ‘given’ innovation-focused structures, and developed within (more traditional) parent organisations, may be questioned. In this sense, future research might explore the extent to which skunkworks could be also considered a legitimate mechanism for – beyond technological development purposes – addressing workforce-related issues. More specifically, further research may also study more deeply other goals of skunkworks projects (Biron et al., 2021), for example, their use for tackling current HR challenges, such as work and health risks for employees arising from the COVID-19 pandemic or improving HRM aspects such as employee learning and development, well-being, creativity, engagement and so forth.

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## DATA AVAILABILITY STATEMENT

Research data are not shared.

## ORCID

Victor Oltra  <https://orcid.org/0000-0002-5009-4127>

## ENDNOTES

- <sup>1</sup> We made sure to interview people from different hierarchical levels according to the standards of the parent organisation (e.g., technicians, middle and top managers).
- <sup>2</sup> An engineer from the advanced marketing department told us: ‘At that time I spent more time in reporting, awaiting authorization and in coordination meetings than actually doing what I had been hired for, that is to say the search for innovations’.
- <sup>3</sup> We can hardly transcribe the enthusiasm which animated this engineer who had never experienced such empowerment and freedom. He was also one of the first to leave the company at the end of the skunkworks, fearing that he would no longer be able to return to the usual bureaucracy.

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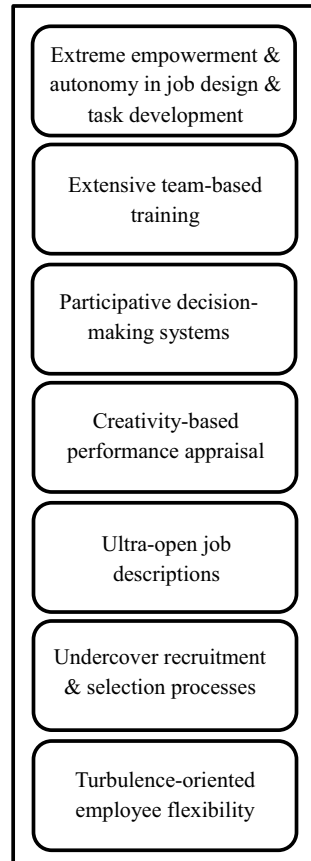
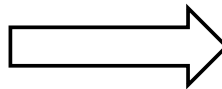
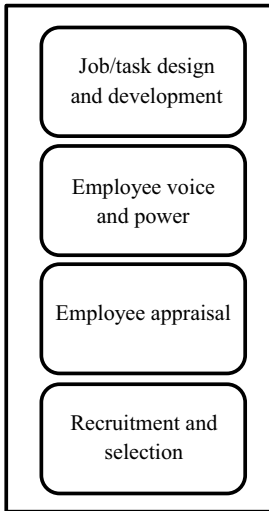
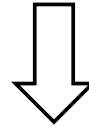
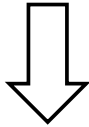
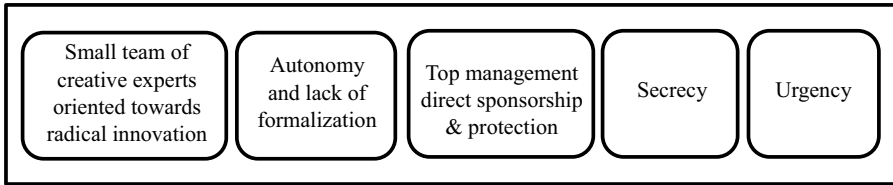
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APPENDIX: DATA ANALYSIS OVERVIEW

Secret technology-oriented skunkworks characteristics

(from literature review)



Preliminary theoretical categories

**Challenges for HRM in (secret technology-oriented) skunkworks in action**

(from literature review)

Final dimensions

**Skunkworks-boosting HR practices for radical technology development**

(from case study)