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Closing the Innovation Performance Gap:
Open Innovation in Military Bureaucracies

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SUMMARY
This article explores the effects of open innovation on innovation performance in military bureaucracies. While the understanding of how bureaucratic organizations can benefit from open innovation is still limited, this study discovered that open innovation can have a negative effect on innovation performance. However, leveraging an innovative culture can lead to improved innovation performance in organizations characterized by high levels of structure and hierarchy, especially those where secrecy and security are of vital importance.

KEYWORDS: open innovation, innovation, military

Organizations increasingly seek to complement their internal research and development activities with inter-organizational collaboration, as part of an open innovation strategy, in order to increase their innovation performance. Open innovation—defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively"[1]—is widely implemented in organizations and has generally been found to enhance the innovation performance of firms.[2] Most of these studies have been carried out in the context of organizations that are already receptive to openness[3]; this leaves room for a more nuanced understanding of open innovation in other types of organizations that are inherently less prone to opening up. Recently, crucial advancements have been made in understanding open innovation strategies and implementation drivers in the context of less-researched

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governmental and military sectors.[4] Still there is less known about the innovation performance effects of open innovation in governmental organizations characterized as bureaucracies (such as military organizations). The existing literature that explores open innovation in these types of organizations specifically highlights the adaptational mechanisms when opening up for innovation, but it does not explicitly focus on the performance implications of this transition, and how managers cope with these implications.[5]

Military organizations in peacetime are particularly interesting because they rely heavily on the core characteristics of bureaucracy: hierarchies of authority, specialized functions, and formalized processes and compliance.[6] Compared with civil bureaucracies, military bureaucracies must adhere to stricter (military) rules, jurisdictions, and hierarchies because national security is at stake.[7] In addition, such large organizations are especially prone to path dependency, inertia, and complacency and they often fail to change. However, an inability to use new practices such as open innovation can have serious consequences for their survival. Nevertheless, empirical research on the performance implications of open innovation in military bureaucracies remains thin.[8]

In this study, we focus on the military as a case of a large, old, internally oriented, compliance bureaucracy.[9] History is rife with examples of how the military's inability to organizationally exploit the benefits of technological advances can lead to defeat and the subsequent collapse of power.[10] Today, confronted with a range of disruptive technologies such as robotics, artificial intelligence, and quantum computing, military organizations are forced to follow a cross-sectoral approach with more open forms of innovation. This has prompted the Netherlands Defence organization to adopt the philosophy of open innovation and to seek innovation performance benefits from it.[11]

While earlier studies have stressed the benefits of open innovation,[12] we highlight the tensions between open innovation and the characteristics of bureaucracy. To implement open innovation, military bureaucracies such as the Netherlands Defence organization need to become more of a learning bureaucracy when they open up their innovation process.[13] This transition poses serious challenges. Certain aspects of a compliant bureaucracy simply do not fit with the open nature of the practice and may therefore constrain processes of desired change.[14] If organizational design is not adjusted to accommodate open innovation, or if support mechanisms for value capture are not in place, the effects of external search activities organized by managers striving for increased innovation performance could turn out to be insignificant or even harmful.[15] Furthermore, being more open to innovation poses serious challenges related to secrecy and security, which are especially significant characteristics of military bureaucracies.[16] We respond to Monteiro and Adler[17] by studying the effects of more openness in innovation in a military bureaucracy transitioning from a dysfunctional to a more flexible paradigm.

To better understand if and how military bureaucracies can benefit from open innovation, we conducted an in-depth, empirical exploration of the effects

of open innovation in the Netherlands Defence organization. We found that open innovation has a negative effect on innovation performance in the context of a military bureaucracy. However, when an innovative culture is present in units that adopt open innovation practices, positive innovation performance is harnessed. These findings have important implications for governmental bureaucratic organizations characterized by high levels of formalization, standardization, and centralization. Prior studies[18] have investigated the process that facilitates (or hinders) the adoption of open innovation practices, or the outcomes of specific open innovation instruments, such as hackathons or living labs in governmental organizations.[19] With this study, we take a broader perspective on open innovation by exploring the performance implications in military bureaucracies.

Literature Review

Misfit of Open Innovation in Military Bureaucracies

Despite recent advancements, the literature is inconclusive in suggesting that open innovation activities will lead to increased innovation performance in military bureaucracies. Military organizations face an increased need to source disruptive technologies through open innovation, due to their limitations in internal R&D capabilities and reduced internal innovation speed (as compared with external developments).[20] In this study, we take an outside-in perspective on open innovation, with military organizations aiming to spin in useful knowledge and technologies for assuring operational readiness, improved combat power, and tactical advantage. However, military bureaucracies are not well-equipped to capture the benefits of an open innovation approach due to their strong focus on secrecy and security, which challenges their ability to access and absorb external knowledge.

To understand the challenges of harnessing the results of open innovation, we draw on the concept of "misfit" and apply it to the context of the military.[21] Moreover, we draw on the literature of military bureaucracies to better understand how the political, cultural, and technical characteristics of open innovation conflict with the organizational characteristics of a compliance bureaucracy.[22]

We first consider *political misfit*. Prior studies have emphasized that the transition to open innovation can be seen as a radical initiative for military bureaucracies, since its implementation requires fundamental changes in the activities of the organization and the constellation of power, and it represents a clear departure from existing practices.[23] Rigidities are expected to be found in the hierarchy, strategy, and centralized power structure that do not favor this transition.[24] In a large, old, and established bureaucratic organization like the military, management systems can be characterized as mechanistic, with clear hierarchical relationships and a deep-seated resistance to structural change. This political characteristic can have serious consequences for an organization's survival when it faces a great deal of pressure to adopt an open innovation philosophy but is unable to flexibly change its hierarchical structure and constellation of power, leading to a political misfit.[25]

Moreover, an open innovation approach requires the partial distribution of power to external parties. That can elicit questions surrounding co-determination of the governance choice between open and bureaucratic innovation efforts.[26] This can be difficult for military bureaucracies in which rules, orders, jurisdictions, and hierarchies are stricter than in civil bureaucracies because national security and human lives are at stake.

To illustrate, a senior military innovation manager explained how current management systems constrain open innovation practices: "The procurement processes do not fit the needs of units and innovators anymore. Those processes take too long, and it also has to do with our requests to the industry: we are only used to a traditional buyer-supplier relationship. In addition, our own R&D is terrible, we do not describe the effects we want properly, and we really have to learn this."

If organizations are overly committed to their own technologies, opening up might be more challenging.[27] This is particularly problematic for the military, where retaining strategic autonomy and being in charge of their own weapon systems, for instance, is of the utmost importance to ensure operational readiness and competitive advantage against adversaries on the battlefield. This diffusion of power can therefore also lead to a political misfit of open innovation.

Next, we identify *cultural misfit*. A lack of alignment and commitment might seriously constrain a successful implementation of the open innovation approach.[28] The mindset of people in the military and the shared conservative norms and values encourage exploitative activities, thereby hampering the exploration of entirely new management activities.[29] An open innovation approach takes considerable time to implement, as deeply ingrained organizational mindsets and the fear of losing control over proprietary technology need to be addressed.[30] The "not-invented-here" syndrome has the potential to thwart open innovation efforts. We expect this cultural trait to be present in a military bureaucracy,[31] leading to a cultural misfit.

A senior innovation manager from the Dutch Army explained his concerns regarding military culture: "Our conservative Defence organization is underrepresented in the "new world." The top management of our organization cannot imagine the current possibilities. Our organization is characterized by people who work here on a long-term basis, and they do not understand external developments well enough. That is our pitfall, so apart from ambition, it is a bare necessity to push innovation through and beat our enemies."

The head of the innovation unit of the Army explained that cultural change is needed:

> My role is to catalyze a cultural change. And from the perspective that we don't do this alone, but we do this together with industry. The extraction of the power of industry is still underdeveloped. Fieldlab Smartbase is a real chance to ignite the cultural change, of which it is clear and outspoken that we need one!

An open innovation consultant explained the importance of Fieldlab Smartbase for cultural change: "Fieldlab Smartbase is a phenomenal, awesome experiment to interact more with the outside world! It is an incredible success, which has been celebrated too little. A lot has been accomplished on such short notice in a large organization with a conservative culture. It has become a great perspective to build on for the future!"

The Netherlands Defence Organization's Open Innovation Model

Open innovation has been adopted into the Netherlands Ministry of Defense's innovation policy 2016. The Navy, Army, Air Force, and Military Police started their own innovation hubs, in which collaboration with SMEs for experimentation with new technologies is stimulated in order to learn about their operational and tactical implications in a military context.

A unique example of open innovation in the Netherlands Defence organization is the "Fieldlab Smartbase" initiative of the Army, in which military experts, SMEs, and knowledge institutes are envisioned as collaborating intensively in order to find innovative solutions to reduce energy and water dependency in military expeditionary camps to support missions and operations. Due to the political, cultural, and technical misfits, this initiative struggles with scaling and implementing suitable technologies for military use and adoption in the organization.

On the other hand, "Netherlands Radar Country" is known as a successful public-private partnership. In this partnership, knowledge is being generated and transferred from a publicly funded independent knowledge institute to an original equipment manufacturer of high-tech radar systems for further technological development to be potentially procured and implemented by the Defence organization and sold to NATO countries.

Third, we identify sources of *technical misfit*, driven by the risk of losing control by leaks of critical knowledge about the organization's innovation efforts to potential enemies. For example, the open innovation literature shows that if the legal department plays a leading role in the implementation process, as is the case in bureaucratic and traditional organizations like militaries, a firm might overemphasize the appropriation of technology developed in an open innovation setting. This can negatively affect prospects for external collaboration, leading to a technical misfit between open innovation practices and the military organization.[32]

An external consultant of the Netherlands Defence organization explained how the management of intellectual property was problematic in experiments with open innovation:

> At the start, the innovation unit presented the condition that during the open innovation experiments, no intellectual property would be created. This turned out to raise questions with the SMEs about how their investments would yield revenues. The innovation unit could not give any guarantees due to the legal tender regulations that exist in the government.

In addition, open innovation may present serious challenges to the organization once implemented. One major problem associated with accessing external sources of knowledge relates to the fact that, in order to obtain knowledge,

organizations have to reveal some parts of their own knowledge to externals; we refer to this problem as the "paradox of openness."[33] This openness to external organizations creates risk, the most extreme form of which is outright theft.[34] In general, firms fear "involuntary outgoing spill-over" or leakage of critical knowledge about the firm's innovation efforts to its competitors.[35] More specifically, this poses a substantial risk for military bureaucracies that need to protect secret knowledge related to core military capabilities and export-controlled technology. Weapon system technology, for instance, needs to be developed in a closed manner, and its intellectual property can only be exploited in a closed defence industrial ecosystem. Due to this technical gap, open innovation can negatively impact long-term innovation success and potentially lead to a loss of both control and core competences.[36]

Military bureaucracies can be compelled to intensify external collaboration to insource disruptive technological innovations (e.g. robotics, artificial intelligence, quantum computing) because of limitations related to internal R&D capacity and the need to accelerate innovation processes.[37] However, the organization is not yet accustomed to supporting open innovation due to a misfit between the characteristics of open innovation and those inherent to a compliant military bureaucracy. The bureaucratic paradigm might as well be dysfunctional, potentially leading to negative consequences for innovation performance.[38] In this study, we empirically explored the effects of open innovation on the innovation performance in the Netherlands Defence organization, and we seek to find answers as to how compliant military bureaucracies can transition to a learning bureaucracy with a flexible paradigm when trying to benefit from open innovation.

Data and Methods

Research Setting

We conducted our empirical research at the Netherlands Defence organization. We chose this organization because empirical data from military bureaucracies that implement and try to benefit from open innovation is scarce, despite recent advancements. The need to better understand if (and how) these types of organizations can benefit from open innovation has intensified, as the implementation of open innovation in military bureaucracies has become more prevalent. Furthermore, military organizations experience significant pressure to experiment with and adopt relevant new technologies, which leads them to seek intensive collaboration with external partners to provide the military with the right knowledge. However, the consequences of broader and deeper external interaction for innovation performance in military bureaucracies are still not well understood.

The Netherlands Defence organization presently finds itself in a transition to more open and closer collaboration with new types of partners. This transition from a closed to an open innovation model can be seen as radical because it represents a clear departure from existing innovation practices and military culture.

Management systems such as procurement and financial regulations need to support the value capture from open innovation.[39] As such, our study focuses on an outlier case of open innovation.

At the time of study in 2020, the Netherlands Defence organization had a yearly budget of approximately 11.0 billion Euros. More recently however (2022), the Dutch government decided to significantly increase the defence budget, growing to the North Atlantic Treaty Organization (NATO) norm of 2.0% gross domestic product (GDP) in 2025 for defence spending, a decision strongly driven by the war in Ukraine. As a derivative of that total budget, R&D spending, innovation, and ecosystem development for defence increased significantly as well. This budget is divided across finance for missions and operations, the apparatus of the core department and supporting services, training, and preparation of operational commands of the Navy, Army, Air Force, and Military Police, and investments in new material, IT, and infrastructure. Although relatively small, the Armed Forces of the Netherlands are among the most advanced armed forces in the world and contribute to peace and stability in the Kingdom of the Netherlands and throughout the world. To retain its position as one of the most advanced armed forces in the world, R&D and (open) innovation are crucial for the Netherlands Defence organization.

Data and Sample

We developed and administered a randomly distributed survey to 4,500 military and civilian personnel. They ranged from senior noncommissioned officers up to the highest officer ranks (or civilian equivalents), at all operational commands and supporting services of the Netherlands Defence organization. The Navy is the oldest department of the Armed Forces, dating back to 1488, and the Military Police is the smallest operational department, with approximately 6,000 military and civilian personnel. The Netherlands Army, founded in 1814, is the largest department with approximately 22,000 military and civilian personnel. The Defence Material Organization, Support Command, and the Policy Department of the Ministry of Defence are responsible for nonoperational support in terms of the products and services, procurement and new material investments, logistics, HR, and policy implementation necessary for operational functioning and Armed Forces capability development. In total, the Ministry of Defence has a population of approximately 66,000 military and civilian personnel, of which 40,000 are military, 20,000 civilian, and 6,000 military reserve personnel. Organizational units of these departments operate in environments that are subject to varying levels of dynamism and operational or nonoperational challenges.

Survey invitations were sent out digitally via an email link, and the software program Lime Survey on the secure Defence computer system, in the period between July 2020 and September 2020. Of the 4,500 survey invitations that were sent, a total of 1,574 surveys were fully completed and included in our analysis. The survey consciously targeted those individuals who were the prime

source of creativity and were involved in innovation-producing encounters.[40] Based on this personal engagement in open innovation, these individuals were asked to judge the innovation performance of their respective organizational unit, assuming that they were in the position to judge the innovation performance of their respective unit.

Empirical Strategy

To collect the relevant data, this study relies on existing scales from the literature, which were adjusted based on conversations with experts from the Netherlands Defence Academy, the Faculty of Military Sciences, the innovation department of the commander of the armed forces, and the policy directorate. We also conducted a pre-test with academics and military field experts to further improve the survey questions. Based on these steps, we were able to develop scales with questions related to the context and everyday work of the respondents (see the separate online appendix to this article). Most of the constructs were measured with 5-point Likert scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An exception was the scale for external orientation (external search breadth and depth), which was measured with five categories representing the intensity of interaction of individuals with 10 different types of external partners,[41] (coalition partners within the EU and NATO); SMEs; large incumbent organizations; consultants; governmental institutions; regional development agencies; knowledge institutes; universities; innovation hubs and incubators; and umbrella organizations such as employers organizations and the Netherlands Industries for Defence and Security.

Based on the responses from each of these partner organizations, we calculated three variables to capture open innovation adoption. *Search breadth* identifies the number of external partners that respondents interacted with; whereas *search depth* counts the number of partners with whom respondents interacted 13 times or more during 2019. To capture *open innovation*, we multiplied the external search breadth and external search depth variables.[42] Because we are interested in the effect of open innovation on innovation performance, we performed a series of hierarchical regression analyses, using radical and incremental innovation performance as our dependent variables.[43] (Descriptive statistics and correlations can be found in the separate online appendix to this article.)

Findings

Table 1 shows a breakdown of the respondents across various descriptive characteristics, whereas Table 2 provides an overview of the interaction with external partners in 2019.

Regarding open innovation, respondents reported collaboration with less than three types of external partners on average, the most prevalent being large organizations (44% of respondents reported at least one interaction with incumbent firms), small and medium-sized enterprises (SMEs) (reported by 42%), and interactions with governmental organizations (41%). Furthermore, most respondents (1,177; 75%)

TABLE 1. Characteristics of Respondents.

Respondents (*N* = 1,574)	
- Military	61%
- Civilian	39%
Gender	
- Man	87%
- Woman	13%
Roles	
- Operational	30%
- Nonoperational	70%
Rank	
- Noncommissioned officer	43%
- Officer	57%
Department	
- Navy	15%
- Army	31%
- Air Force	13%
- Military Police	7%
- Support Command	17%
- Defence Material Organization	14%
- Policy Directorate	2%

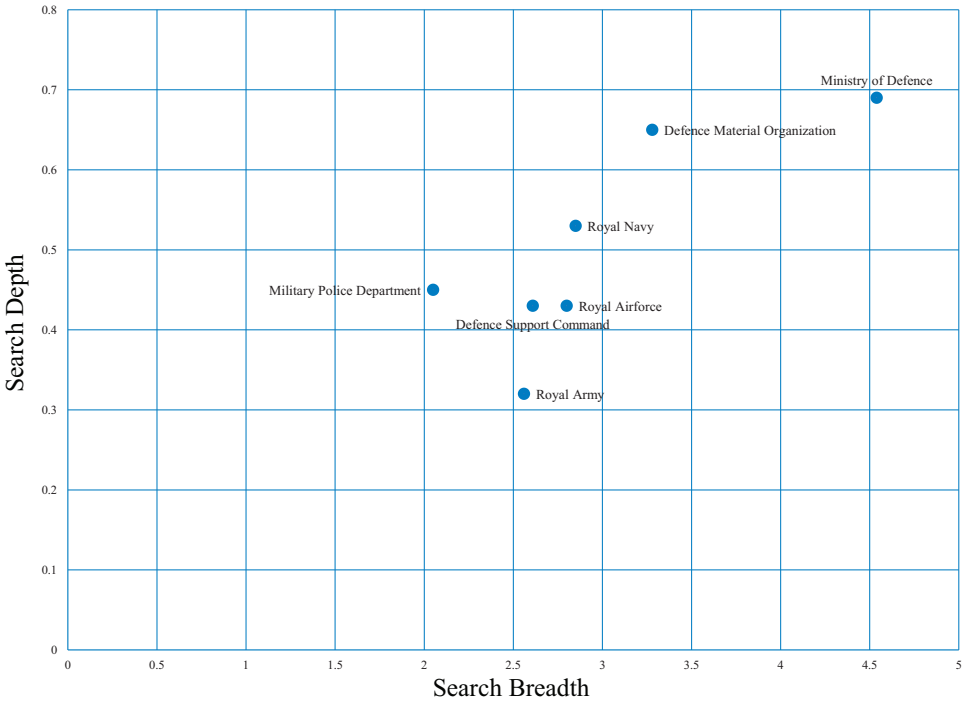
did not interact intensively (less than 13 times a year) with partners in the year 2019. However, 219 respondents (14%) confirmed that they interacted intensively (13 or more times per year) with one partner, and 100 respondents (6%) confirmed that they interacted intensively with two partners.

In Figure 1, we have plotted the search strategies of the different departments within the Netherlands Defence organization. Interestingly, there appears to be quite some difference in the search strategies employed by the different departments, with the Ministry of Defence searching far more broadly (4.5 sources on average) than the Royal Military Police Department with two types of external partners on average. Similarly, the Ministry of Defence appears to engage more deeply with its innovation partners than the Royal Army, for example. These insights underscore the heterogeneity of open innovation adoption in the Netherlands Defence organization.

TABLE 2. Use of External Sources in 2019 (%).

	No interaction	1-4 interactions	5-12 interactions	13-24 interactions	More than 24 interactions
Allies	60	24	8	2	6
SMEs	58	24	10	3	5
Incumbents	56	26	8	4	6
Consultants	69	23	5	2	2
Governmental organizations	59	27	8	2	4
Regional development agencies	96	3	1	0	0
Knowledge institutes	69	20	7	1	3
Universities	74	19	4	1	2
Innovation Hubs	93	6	1	0	0
Umbrella organizations	93	6	1	0	0

FIGURE 1. Search Breadth and Depth across Defence Departments



What Is the Effect of Open Innovation on Innovation Performance in Military Bureaucracies?

We found that open innovation has a nonsignificant negative effect on incremental innovation and a significant negative effect on radical innovation performance. For military bureaucracies like the Netherlands Defence organization, investing in open innovation activities does not improve their innovation performance. Instead, open innovation does not influence the creation of incremental innovation outputs and even reduces the creation of radical innovation outputs. This means that open innovation activities (i.e. diverse and intensive external interactions of the Defence organization), do not contribute to the improvement of operational military systems or improved military concepts of operation in use (incremental innovation performance). In addition, open innovation activities seem to harm the implementation of new military systems or the integration of new military concepts of operation (radical innovation performance).

This negative effect is primarily driven by search breadth—that is, the greater the diversity of the sources the organization is tapping into, the lesser the incremental and radical innovation performance. In fact, search depth enhances incremental innovation outputs. For military bureaucracies, it appears that tapping into a broad range of external innovation partners is harmful rather than helpful, while they could benefit from deeper engagement with external actors to improve their incremental innovation performance.

How Can the (Potentially) Negative Effects of Open Innovation on Innovation Performance in Military Bureaucracies Be Mitigated?

To answer our second research question, we further explored how the negative effects of open innovation on innovation performance might be mitigated. Based on prior literature, we added organizational design and response variables—such as slack resources, formalization, and innovative culture—as contingencies to better understand the relationship between open innovation and innovation performance.

First, we included *slack resources*, which are defined as the degree to which adequate resources are available to accomplish the task of innovation.[44] The availability of resources has previously been theorized as being critical to innovation.[45] Therefore, we assumed that in the context of open innovation in a military bureaucracy, slack resources would contribute to the ability to learn and to be more flexible to capture value from open innovation. We suspected that there might be a positive innovation performance effect when resources for open innovation were seen as adequate. Although we discovered that the variable slack resources were significant and positive in all models, we did not find a moderation effect of slack resources on the relationship between open innovation and innovation performance.

Second, we included *formalization*, which is defined as the degree to which rules, procedures, instructions, and communications within the organization are documented.[46] Formalization constrains exploration efforts and is generally established to respond to environmental phenomena in a known way.[47] We anticipated that formalization is more in line with the characteristics of a compliant bureaucracy or a dysfunctional paradigm. Therefore, we assumed that formalization would hamper the innovation performance effects of open innovation, as open innovation requires the exploration of new phenomena in the external environment. However, we could not confirm this by our analysis.

Finally, we considered *innovative culture*. A culture that is strongly supportive of innovation significantly and positively affects innovative capacity by increasing the organization's ability to successfully implement new ideas, processes, and technology.[48] As such, we assumed that an innovative culture is more in line with the characteristics of a learning bureaucracy and flexible paradigm. Therefore, an innovative culture has a positive effect on the relationship between open innovation and innovation performance.

An innovative culture fully mitigates the negative performance implications of open innovation on incremental innovation, while strongly reducing the negative effects of open innovation on radical innovation performance. More specifically, an innovative culture weakens the negative effect of search breadth on radical innovation performance, whereas having an innovative culture fully mitigates the negative performance effects of search depth—if an innovative culture is present, military bureaucracies can benefit from deep engagement with external partners to implement new military systems or integrate new military concepts of operation (see online appendix for more information).

These results suggest that in terms of closing the innovation performance gap, the significant negative effects of open innovation on both incremental and radical innovation performance can be mitigated by implementing an innovative culture, leading to positive innovation performance in military bureaucracies. This means that an innovative culture can be seen as a necessary condition for open innovation to flourish when military bureaucracies are in the process of establishing an open innovation model for boosting innovation performance.

Discussion

Although existing research suggests that external sourcing activities have a positive effect on innovation performance, scholars have only just begun to explore how these types of innovation activities influence innovation performance in military bureaucracies.[49] Our study contributes to understanding how these organizations can mitigate the negative innovation performance effects of open innovation. Without paying attention to the misfit of open innovation in a compliant bureaucracy and enhancing value capture by stimulating an innovative culture, open innovation may turn out to be harmful.

Scholarly Implications

We have diverged from the findings of earlier studies that highlighted open innovation in organizational contexts that are already receptive to openness.[50] Previous studies have not yet empirically identified the innovation performance effects of carrying out open innovation in military bureaucracies. The findings of our study emphasize the importance of thinking about how to make open innovation work in a traditionally closed organizational context. Surprisingly, we found that in the context of military bureaucracies, the effect of more diverse and more intense external interaction can be harmful: it does not contribute to the achievement of incremental innovations, and it even harms the realization of radical innovations if not matched with an innovative culture.

We draw special attention to the paradoxical situation in which bureaucratic organizations are forced to implement open innovation by their environment and simultaneously aim to increase innovation performance.[51] Institutional theory suggests that organizations seek conformity with other organizations because they depend on external support and legitimacy.[52] Following this notion of conformity, organizations strive to resemble other organizations in their environment that set institutional norms.[53] If open innovation is a popular practice in an institutional field, organizational design is adjusted accordingly, leading to the widespread adoption of open innovation practices. In our specific case, the military also seeks to benefit from insourcing new technologies and increasing innovation speed in an open innovation setting. However, the military bureaucracy is not yet accustomed internally to such radical innovation practices. While at first glance this situation seems intractable, we show that an innovative culture can assuage problems related to this paradox. Innovation performance can even be further stimulated by making use of slack resources when an innovative culture is already in place in the organization.

Our study also supports earlier findings,[54] by showing that new innovation practices may be adopted despite being harmful to organizations because these organizations seek to comply with institutional norms. The prospect of enhanced legitimacy might thus be a more important argument for the adoption of new innovation practices than the absence of evidence of enhanced innovation performance; this imposes a risk for the capacity to fully exploit its benefits. It is therefore advised that, when there is a tendency to adopt popular innovation practices for reasons of legitimacy, a deliberate and thorough strategic assessment is done to determine if the implementation is likely to increase innovation performance.

Open innovation is by nature very different from a compliant military bureaucracy, leading to dysfunctionality. Based on the premise that there is a misfit between the new innovation practice and the characteristics of a military bureaucracy, cultural, technical, and political constraints need to be overcome during the implementation process. Incorporating external collaboration in an open innovation setting on a regular basis therefore seems unnatural. This increases the necessity to adopt more of a learning bureaucratic mentality to facilitate the implementation process in order to become more innovative.

Large bureaucratic organizations in general—be they governmental, for-profit, or not-for-profit—can take advantage of the findings based on this unique open innovation case—in particular, because traditional military bureaucratic characteristics seem to be at odds with the qualities needed for open innovation. The closed and inward-focused nature of military organizations can also be found in other bureaucracies, for instance in the security sector. As such, the Netherlands Defence organization is a useful case of an extreme open innovation model that may serve as an example for similar organizations.[55]

A culture that is strongly supportive of innovation significantly and positively affects innovative capacity as well as the organization's ability to successfully implement new ideas, processes, and technology, that is, its innovation performance. Scholars have found that a distinction can be made between the degree of radicalness of innovation and the importance of an innovative culture within the organization. For radical innovation projects, a culture of innovation is a primary key to achieving success in setting up new service projects, for instance. For incremental new service projects, however, an innovation culture is found to be of secondary importance, though it still has a significant positive effect on innovation performance. These findings are in line with the results of our study, corroborating the idea that an innovative culture is even more important in improving *radical* innovation performance than in stimulating *incremental* innovation performance. In addition, these findings are especially relevant when a military bureaucracy has not yet adapted to the character of learning and flexibility associated with an open innovation paradigm, and striving for radical innovation performance with open innovation imposes the highest risk.

From a management innovation perspective, it is assumed that successful implementation of open innovation requires alignment with the organization's cultural characteristics. An externally oriented focus is consistent with an open

innovation philosophy and refers to organizations that are actively engaged in partnerships with knowledge institutes, industry, and governmental organizations. This philosophy requires that certain organizational characteristics in military bureaucracies must be considered when adopting the concept, such as how to cope with rigidly sticking to procedures.[56]

The motivation to adopt open innovation is followed by a phase of experimentation in which the organization determines how to incorporate new open innovation practices.[57] It is to be expected that, in this phase, an open innovation strategy is not yet fully in place, nor is it aligned with the organization's bureaucratic innovation strategy. This misalignment may severely limit opportunities to successfully develop and exploit technology or be successful in open innovation.[58]

A tolerance for ambiguity allows the organization to be partially misaligned, which helps to overcome tensions between the nature of the new practice and the organization itself. This is even more important when the new practice represents a significant departure from existing practice and is systemic or radical in nature, such as open innovation and its impacts on a military bureaucracy.[59]

Managerial Implications

Open innovation as an innovation practice is, by nature, very different from the closed context of a military bureaucracy. Earlier studies highlighted open innovation in organizational contexts that are already receptive to openness.[60] This study is innovative because it highlights the effects of open innovation in a closed context. It is therefore unique and relevant for managers aiming to implement open innovation in organizations that are less receptive to openness.

Investments clearly take precedence over the potential gains associated with more openness, and implementing open innovation in military bureaucracies is very difficult for the managers who are responsible for this task. These processes might also be expensive because implementing open innovation strongly impacts the way innovation is being done and requires organizational changes which also consumes scarce resources that managers need to prioritize. Policy makers should therefore be conscious of the fact that, to make open innovation work effectively in these types of organizations, substantial changes in organizational culture and administrative support systems are needed. It should be noted that these aspects might not be aligned with the characteristics of a compliant bureaucracy, such as hierarchical and centralized power structures and a "stove pipe" organization in fields of expertise.[61] Also, implementing open innovation in military bureaucracies requires the support of top management, long-term effort, and a significant amount of resources in order to be validated as a new way of doing innovation.

We echo the findings of Keupp and Gassmann,[62] who highlight the high transaction costs of interpersonal coordination in open innovation. What is surprising is that an innovative culture is necessary for positive innovation performance results. The cultural misfit between the practice and the organization

therefore seems to be the most important gap to bridge through leadership intervention in this context. It is however strongly recommended to reduce the technological and political gaps as well. Administrative support systems should be developed, enabling individuals in units to interact directly with external partners, complemented with the required mandates to be effective in these endeavors. Also, senior leadership should empower these decentralized units and their actors. They should be able to make decisions on their level about the appropriateness of collaboration with certain partners, and the technological and operational solutions they can potentially provide.

It is important to look specifically at the role of innovative culture in the context of military bureaucracies because, as Witzeman et al.[63] explain, it is not only technological systems that need to change when transitioning to open innovation. The more external innovation is sourced by the firm, the greater the need to transform systems, processes, values, and culture. We responded to this call because knowledge about systemic change in the context of open innovation, as a form of management innovation in military bureaucracies, is limited.[64]

Based on the findings in this study, we show that open innovation activities have a negative effect on innovation performance in bureaucratic organizations, but this can however be mitigated by an innovative culture. In practice, a negative effect on innovation performance means that open innovation efforts, which can take the form of individuals interacting with external actors, collaboration with SMEs, and experimentation with new technology for instance, will not lead to improved operational concepts or new military capabilities. Our findings provide a better understanding of the disadvantages of open innovation in the preliminary phases, in which managers in military bureaucracies question how to implement related practices most effectively.[65]

An innovative culture is crucial to diminishing the negative effects of open innovation in military bureaucracies. Intervention programs that focus on increasing the innovativeness of organizational culture might therefore be very helpful. This could for instance be accomplished by allowing deviation from bureaucratic hierarchies, rules, or procedures when it is necessary to attain goals in open innovation and cultivate a more flexible bureaucratic paradigm.[66] And if leadership promotes the introduction of innovative ideas and experimentation as a way of working, the innovativeness of the organization's culture can be enhanced as well. Results show that when an innovative culture is present in a subunit that performs open innovation activities, slack resources for innovation can further enhance the positive benefits on innovation performance. However, when an innovative culture is not present, providing more resources for open innovation will not be sufficient to instate a positive effect from open innovation on innovation performance in a military bureaucracy. This is an important managerial implication because it points to the necessity to address the cultural gap first, before allocating extra resources.

We find that the effect of an innovative culture on incremental innovation performance is strong enough to compensate for the negative effects of

open innovation. Radical innovation performance suffers stronger negative effects from open innovation as compared with incremental innovation performance. However, a positive radical innovation performance result can be realized by employing intense interaction with specific partners instead of a broad range of partners. This implies that striving for strong, long-term relationships with external partners is crucial to realizing radical innovation performance in open innovation. In the context of the military, incremental innovation performance is the degree to which existing capabilities are improved with upgrades of military systems in use. Radical innovation performance, however, is the successful implementation of entirely new systems.

From a management point of view, the risk associated with seeking radical innovation is greater than seeking incremental innovation in the absence of an innovative culture. It is assumed that the reasons for this reside in the fact that for the organization to successfully implement new capabilities, significant internal reform is required to support such an implementation. For instance, new knowledge needs to be acquired and absorbed, training and education programs need to be developed, logistic support must be organized, and new concepts of operation need to be integrated.

An innovative culture that has room for experimentation and the stimulation of the introduction of new ideas by leadership can provide the flexibility to integrate these aspects more easily. Building on the insight that open innovation has a positive effect on innovation performance,[67] we provide a more nuanced view and advise bureaucracies to exploit open innovation only in those subunits with an innovative culture that have adopted aspects of a learning bureaucracy.[68]

Conclusion

In the transition to an open innovation model and a more functional bureaucratic paradigm, not all essential characteristics are present in a military bureaucracy and they need to be developed during implementation. A military bureaucracy with an innovative culture is better equipped to bridge this gap.

Supplemental Material

Supplemental material for this article is available online.

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Notes

1. H. Chesbrough and A. M. Crowther, "Beyond High Tech: Early Adopters of Open Innovation in Other Industries," *R&D Management*, 36/3 (June 2006): 229-236.
2. H. W. Chesbrough, *Open Innovation: The New Imperative for Creating and Profiting from Technology* (Boston, MA: Harvard Business School Press, 2003); Y. H. Chiang and K. P. Hung, "Exploring Open Search Strategies and Perceived Innovation Performance from the Perspective of Inter-Organizational Knowledge Flows," *R&D Management*, 40/3 (June 2010): 292-299; K. Laursen and A. Salter, "Open for Innovation: The Role of Openness in Explaining Performance among UK Manufacturing Firms," *Strategic Management Journal*, 27/2 (February 2006): 127-150.
3. L. Rosenkopf and A. Nerkar, "Beyond Local Search: Boundary Spanning, Exploration, and Impact in the Optical Disk Industry," *Strategic Management Journal*, 22/4 (April 2001): 287-306; G. Ahuja and R. Katila, "Technological Acquisitions and the Innovation Performance of Acquiring Firms: A Longitudinal Study," *Strategic Management Journal*, 22/3 (March 2001): 197-220; R. Veugelers and B. Cassiman, "Make and Buy in Innovation Strategies: Evidence from Belgian Manufacturing Firms," *Research Policy*, 28/1 (January 1999): 63-80; R. Van Wijk, J. J. P. Jansen, F. van den Bosch, and H. W. Volberda, "How Firms Shape Knowledge to Explore and Exploit: A Study of Knowledge Flows, Knowledge Stocks and Innovative Performance across Units," *Technology Analysis and Strategic Management*, 24/9 (2012): 929-950.
4. A. Kankanhalli, A. Zuiderwijk, and G. K. Tayi, "Open Innovation in the Public Sector: A Research Agenda," *Government Information Quarterly*, 34/1 (January 2017): 84-89; J. Langlois, S. BenMahmoud-Jouini, and R. Servajean-Hilst, "Practicing Secrecy in Open Innovation—The Case of a Military Firm," *Research Policy*, 52/1 (January 2023): 104626.
5. J. Molas-Gallart, "Which Way to Go? Defence Technology and the Diversity of 'Dual-Use' Technology Transfer," *Research Policy*, 26/3 (October 1997): 367-385, H. De Vries, V. Bekkers, and L. Tummers, "Innovation in the Public Sector: A Systematic Review and Future Research Agenda," *Public Administration*, 94/1 (March 2016): 146-166.
6. P. S. Adler, "The Learning Bureaucracy: New United Motor Manufacturing, Inc.," *Research in Organizational Behavior*, 15 (1993): 111-194; P. Monteiro and P. S. Adler, "Bureaucracy for the 21st Century: Clarifying and Expanding Our View of Bureaucratic Organization," *Academy of Management Annals*, 16/2 (July 2022): 427-475.
7. S. I. Kitaoka, " The Army as Bureaucracy: Japanese Militarism Revisited," *The Journal of Military History*, 57/5 (1993): 67.
8. C. A. O'Reilly and M. L. Tushman, "Organizational Ambidexterity: Past, Present, Future," *Academy of Management Journal*, 27/4 (November 2013): 324-338; R. M. Walker, J. Chen, and D. Aravind, "Management Innovation and Firm Performance: An Integration of Research Findings," *CUNY Academic Works*, 33/5 (October 2015): 407-422.
9. H. Mintzberg, "Structure in 5's: A Synthesis of the Research on Organization Design," *Management Science*, 26/3 (March 1980): 322-341; B. Rosen, *Holding Government Bureaucracies Accountable* (Westport, CT: Praeger, 1998).
10. M. G. Knox and W. Murray, *The Dynamics of Military Revolution 1300-2050* (Cambridge, UK: Cambridge University Press, 2001).

11. E. K. R. E. Huizingh, "Open Innovation: State of the Art and Future Perspectives," *Technovation*, 31/1 (January 2011): 2-9; L. Roxborough, "Organizational Innovation: Lessons from Military Organizations," *Sociological Forum*, 15/2 (June 2000): 362-377.
12. J. B. Cullen, J. L. Johnson, and T. Sakano, "Success through Commitment and Trust: The Soft Side of Strategic Alliance Management," *Journal of World Business*, 35/3 (3rd Quarter 2000): 223-240.
13. Adler (1993), op. cit.; R. A. Gabriel, "Acquiring New Values in Military Bureaucracies: A Preliminary Model," *Journal of Political & Military Sociology*, 7/1 (Spring 1979): 89-102; Kitaoka (1993), op. cit.
14. S. Ansari, J. Reinecke, and A. Spaan, "How are Practices Made to Vary? Managing Practice Adaptation in a Multinational Corporation," *Organization Studies*, 35/9 (September 2014): 1313-1341.
15. K. Laursen and A. J. Salter, "The Paradox of Openness, Appropriability, External Search and Collaboration," *Research Policy*, 43/5 (June 2014): 867-878; M. Bogers, N. J. Foss, and J. Lyngsie, "The 'Human Side' of Open Innovation: The Role of Employee Diversity in Firm-Level Openness," *Research Policy*, 47/1 (February 2018): 218-231; H. Chesbrough and M. Bogers, "Explicating Open Innovation: Clarifying an Emerging Paradigm for Understanding Innovation," in *New Frontiers in Open Innovation*, ed. H.W. Chesbrough, W. Vanhaverbeke, and J. West (Oxford: Oxford University Press, 2014), pp. 3-28; N. J. Foss, K. Laursen, and T. Pedersen, "Linking Customer Interaction and Innovation: The Mediating Role of New Organizational Practices," *Organization Science*, 22/4 (July/August 2011): 980-999; C. Hienerth, E. Von Hippel, and M. B. Jensen, "Innovation as Consumption: Analysis of Consumers' Innovation Efficiency," MIT Sloan School of Management Working Paper # 4926-11, 2011; G. Lorenzoni and A. Lipparini, "The Leveraging of Interfirm Relationships as a Distinctive Organizational Capability: A Longitudinal Study," *Strategic Management Journal*, 20/4 (April 1999): 317-338; W. W. Powell, K. W. Koput, and L. Smith-Doerr, "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology," *Administrative Science Quarterly*, 41/1 (March 1996): 116-145; X. Zhu, Z. Xiao, M. Dong, and J. Gu, "The Fit between Firms' Open Innovation and Business Model for New Product Development Speed: A Contingency Perspective," *Technovation*, 86-87 (August/September 2019): 75-85.
16. Langlois et al. (2023), op. cit.
17. Monteiro and Adler (2022), op. cit.
18. E. Loukis, Y. Charalabidis, and A. Androutsopoulou, "Promoting Open Innovation in the Public Sector through Social Media Monitoring," *Government Information Quarterly*, 34/1 (January 2017): 99-109; I. Mergel, "Open Innovation in the Public Sector: Drivers and Barriers for the Adoption of Challenge," *Public Management Review*, 20/5 (2018): 726-745.
19. Q. Yuan and M. Gasco-Hernandez, "Open Innovation in the Public Sector: Creating Public Value through Civic Hackathons," *Public Management Review*, 23/4 (2021): 523-544; M. Gascó, "Living Labs: Implementing Open Innovation in the Public Sector," *Government Information Quarterly*, 34/1 (January 2017): 90-98.
20. Roxborough (2000), op. cit.
21. S Ansari, P. Krop, M. T. Hansen, and T. Bohné, "Made to Fit: How Practices Vary as They Diffuse," *Academy of Management Review*, 35/1 (January 2010): 67-92; Ansari et al. (2014), op. cit.; Gabriel (1979), op. cit.
22. Adler (1993), op. cit.; Ansari et al. (2014), op. cit.; Gabriel (1979), op. cit.; Kitaoka (1993), op. cit.; Kankanhalli et al. (2017), op. cit.; Langlois et al. (2023), op. cit.; Mergel (2018), op. cit.; Walker et al. (2015), op. cit.; E. J. Zajac, M. S. Kraatz, and R. K. Bresser, "Modeling the Dynamics of Strategic Fit: A Normative Approach to Strategic Change," *Strategic Management Journal*, 21/4 (April 2000): 429-453.
23. R. D. Dewar and J. E. Dutton, "The Adoption of Radical and Incremental Innovations: An Empirical Analysis," *Management Science*, 32/11 (November 1986): 1422-1433; F. Damanpour, "Innovation Type, Radicalness, and the Adoption Process," *Communication Research*, 15/5 (October 1988): 545-567.
24. T. Blumentritt and W. M. Danis, "Business Strategy Types and Innovative Practices," *Journal of Managerial Issues*, 18/2 (Summer 2006) 274-291.
25. Kitaoka (1993), op. cit.; O'Reilly and Tushman (2013), op. cit.; P. S. Tolbert and L. G. Zucker, "Institutional Sources of Change in the Formal Structure of Organizations: The Diffusion of Civil Service Reform," *Administrative Science Quarterly*, 28/1 (March 1983): 22-39.

26. C. M. Christensen, H. Baumann, R. Ruggles, and T. M. Sadtler, "Disruptive Innovation for Social Change," *Harvard Business Review*, 84/12 (December 2006): 94; V. Van de Vrande, C. Lemmens, and W. Vanhaverbeke, "Choosing Governance Modes for External Technology Sourcing," *R&D Management*, 36/3 (June 2006): 347-363.
27. U. Lichtenthaler and H. Ernst, "External Technology Commercialization in Large Firms: Results of a Quantitative Benchmarking Study," *R&D Management*, 37/5 (November 2007): 383-397.
28. Chesbrough and Crowther (2006), op. cit.; Mintzberg (1980), op. cit.; A. Holmberg and A. Alvinius, "How Pressure for Change Challenge Military Organizational Characteristics," *Defense Studies*, 19/2 (2019): 130-148.
29. A. R. Jassawalla and H. C. Sashittal, "Cultures that Support Product Innovation Processes," *Academy of Management Journal*, 16/3 (August 2002); R. Katz and T. J. Allen, "Investigating the Not Invented Here (NIH) Syndrome: A Look at the Performance, Tenure, and Communication Patterns of 50 R&D Project Groups," *R&D Management*, 12/1 (January 1982): 7-20.
30. H. Chesbrough, "A Better Way to Innovate," *Harvard Business Review*, 81/7 (July 2003): 112-115; Chesbrough and Crowther (2006), op. cit.
31. Mintzberg (1980), op. cit.; Holmberg and Alvinius (2019), op. cit.
32. Laursen and Salter (2006), op. cit.; Chesbrough and Crowther (2006), op. cit.; O. Alexy, P. Criscuolo, and A. Salter, "Does IP Strategy Have to Cripple Open Innovation?" *MIT Sloan Management Review*, 51/1 (Fall 2009): 71-77; M. Reitzig and P. Puranam, "Value Appropriation as an Organizational Capability: The Case of IP Protection through Patents," *Strategic Management Journal*, 30/7 (July 2009): 765-789.
33. Laursen and Salter (2014), op. cit.
34. J. S. Gans and S. Stern, "The Product Market and the Market for 'Ideas': Commercialization Strategies for Technology Entrepreneurs," *Research Policy*, 32/2 (February 2003): 333-350.
35. B. Cassiman and R. Veugelers, "R&D Cooperation and Spillovers: Some Empirical Evidence from Belgium," *American Economic Review*, 92/4 (September 2002): 169-1184.
36. L. Dahlander and D. M. Gann, "How Open is Innovation?" *Research Policy*, 39/6 (2010): 699-709; E. Enkel, O. Gassmann, and H. Chesbrough, "Open R&D and Open Innovation: Exploring the Phenomenon," *R&D Management*, 39/4 (September 2009): 311-316.
37. Roxborough (2000), op. cit.; H. W. Volberda, F. A. J. van den Bosch, and O. R. Mihalache, "Advancing Management Innovation, Synthesizing Processes, Levels of Analysis, and Change Agents," *Organization Studies*, 35/9 (September 2014): 1245-1264.
38. Adler (1993), op. cit.; Ansari et al. (2010), op. cit.; Monteiro and Adler (2022), op. cit.
39. Bogers et al. (2018), op. cit.; Damanpour (1988), op. cit.
40. A. Majchrzak, M. L. Bogers, H. Chesbrough, and M. Holgersson, "Creating and Capturing Value from Open Innovation: Humans, Firms, Platforms, and Ecosystems," *California Management Review*, 65/2 (Winter 2023): 5-21.
41. Laursen and Salter (2006), op. cit.
42. Laursen and Salter (2014), op. cit.
43. J. J. P. Jansen, F. A. J. van den Bosch, and H. W. Volberda, "Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators," *Management Science*, 52/11 (November 2006): 1661-1674.
44. S. G. Scott and R. A. Bruce, "Determinants of Innovative Behavior: A Path Model of Individual Innovation in the Workplace," *Academy of Management Journal*, 37/3 (June 1994): 580-607.
45. P. Lawrence and P. Dyer, *Renewing American Industry* (New York, NY: Free Press, 1983).
46. Jansen et al. (2006), op. cit.; B. J. Jaworski and A. K. Kohli, "Market Orientation: Antecedents and Consequences," *Journal of Marketing*, 57/3 (July 1993): 53-70.
47. R. L. Daft and R. H. Lengel, "Organizational Information Requirements, Media Richness and Structural Design," *Management Science*, 32/5 (May 1986): 554-571; M. A. Lyles and C. R. Schwenk, "Top Management, Strategy and Organizational Knowledge Structures," *Journal of Management Studies*, 29/2 (March 1992): 155-174.
48. H. Ernst, "Patent Information for Strategic Technology Management," *World Patent Information*, 25/3 (September 2003): 233-242; R. F. Hurley and G. T. M. Hult, "Innovation, Market Orientation, and Organizational Learning: An Integration and Empirical Examination," Journal of Marketing, 62/3 (July 1998): 42-54; M. Škerlavaj, J. H. Song, and Y. Lee, "Organizational Learning Culture, Innovative Culture and Innovations in South Korean Firms," *Expert Systems with Applications*, 37/9 (September 2010): 6390-6403; P. Bate, "The Impact of Organizational

Culture on Approaches to Organizational Problem-Solving," *Organization Studies*, 5/1 (January 1984): 43-66; W. G. Ouchi, "A Conceptual Framework for the Design of Organizational Control Mechanisms," *Management Science*, 25/9 (September 1979): 833-848; C. Camerer and A. Vepsalainen. "The Economic Efficiency of Corporate Culture," *Strategic Management Journal*, 9/S1 (Summer 1988): 115-126; G. Hofstede, B. Neuijen, D. D. Ohayv, and G. Sanders, "Measuring Organizational Cultures: A Qualitative and Quantitative Study across Twenty Cases," *Administrative Science Quarterly*, 35/2 (June 1990): 286-316.

49. Langlois et al. (2023), op. cit.; De Vries et al. (2016), op. cit.
50. Rosenkopf and Nerkar (2001), op. cit.; Ahuja and Katila (2001), op. cit.; Veugelers and Cassiman (1999), op. cit.; Van Wijk et al. (2012), op. cit.
51. A. Sturdy, "The Adoption of Management Ideas and Practices: Theoretical Perspectives and Possibilities," *Management Learning*, 35/2 (June 2004): 155-179; Volberda et al. (2014), op. cit.
52. Tolbert and Zucker (1983), op. cit.
53. A. Z. Kondra and C. R. Hinings, "Organizational Diversity and Change in Institutional Theory," *Organization Studies*, 19/5 (September 1998): 743-767.
54. F. R. Khan, K. A. Munir, and H. Willmot, "A Dark Side of Institutional Entrepreneurship: Soccer Balls, Child Labor, and Postcolonial Impoverishment," *Organization Studies*, 28/7 (July 2007): 1055-1077.
55. R. K. Yin, "Designing Case Studies," *Qualitative Research Methods*, 5/14 (2003): 359-386.
56. Knox and Murray (2001), op. cit.; Langlois et al. (2023), op. cit.
57. J. M. Birkinshaw, G. Hamel, and M. J. Mol, "Management Innovation," *Academy of Management Review*, 33 (2008): 825-845.
58. J. A. Baum, T. Calabrese, and B. S. Silverman, "Don't Go It Alone: Alliance Network Composition and Startups' Performance in Canadian Biotechnology," *Strategic Management Journal*, 21/3 (March 2000), 267-294.
59. S. Khanagha, M.T. Ramezan Zadeh, O. R. Mihalache, and H. W. Volberda, "Embracing Bewilderment: Responding to Technological Disruption in Heterogeneous Market Environments," *Journal of Management Studies*, 55/7 (November 2018): 1079-1121.
60. Rosenkopf and Nerkar (2001), op. cit.; Ahuja and Katila (2001), op. cit.
61. Adler (1993), op. cit.
62. M. M. Keupp and O. Gassmann, "Determinants and Archetype Users of Open Innovation," *R&D Management*, 39/4 (September 2009): 331-341.
63. S. Witzeman, G. Slowinski, R. Dirkx, L. Gollob, J. Tao, S. Ward, and S. Miraglia, "Harnessing External Technology for Innovation," *Research Technology Management*, 49/3 (May/June 2006): 19-27.
64. R. M. Walker, F. Damanpour, and C. A. Devece, "Management Innovation and Organizational Performance: The Mediating Effect of Performance Management," *Journal of Public Administration Research and Theory*, 21/2 (April 2010): 367-386; Walker et al. (2015), op. cit.
65. W. Vanhaverbeke, V. van de Vrande, and H. Chesbrough, "Understanding the Advantages of Open Innovation Practices in Corporate Venturing in Terms of Real Options," *Creativity and Innovation Management.* 17/4 (December 2008): 251-258.
66. Monteiro and Adler (2022), op. cit.
67. C. M. Beckman, P. R. Haunschild, and D. J. Phillips, "Friends or Strangers? Firm-Specific Uncertainty, Market Uncertainty, and Network Partner Selection," *Organization Science*, 15/3 (May/June 2004): 259-374; L. Rosenkopf and P. Almeida, "Overcoming Local Search Through Alliances and Mobility," *Management Science*, 49/6 (June 2003): 751-766.
68. Adler (1993), op. cit.