

The role of communication in open innovation processes: an action research study in the automotive industry

O papel DA comunicação corporativa nos processos DE inovação aberta: uma análise DA indústria automotiva por meio DA pesquisa-ação

EL rol DE LA comunicación EN los procesos DE innovación abierta: UN estudio DE action research EN LA industria DE automoción

María Jesús Yáñez-Galdames

*Department of Marketing and Communication Enterprises,
University of Navarra, Pamplona, Spain*

José A. Alfaro-Tanco

Department of Business, University of Navarra, Pamplona, Spain, and

Elena Gutiérrez-García

*Department of Marketing and Communication Enterprises,
University of Navarra, Pamplona, Spain*



Abstract

Purpose – This study aims to identify the main barriers and drivers that influence the role of communication in open innovation (OI) activities, and how these can support and enhance the innovative capacity of companies in the automotive industry. In order to get this, we carry out in an assembly plant of an automotive firm.

The authors want to thank you for the involved firms and organizations and to signal that this study was funded by the “Cátedra de Empresa Volkswagen Navarra – Universidad de Navarra”.

Design/methodology/approach – An action research study is carried out with the participation of the researchers, the Innovation and Communication managers of the assembly plant and four external stakeholders who have participated in OI dynamics carried out by the company.

Findings – It is observed that collaborative practices are integrated within the culture of the assembly plant. This is carried out according to the specific needs of the company, which limits the specificity of the stakeholders with which it collaborates. In terms of communication, the proposed functions are evidenced in practice. However, it is advisable to systematize these functions and to acquire, in the case of communication professionals, specific skills to support the integration of open practices.

Originality/value – Although studies exist that analyze OI in the automotive process, none have focused on how communication may help reinforce it. In addition, this study shows how communication may play a significant role in an assembly plant where research and development activities may not be important. Thus, the contribution of this study is twofold. On the one hand, it enriches the literature on OI; on the other hand, it proposes policies to improve the performance of OI practices by involving communication at all stages.

Keywords Open innovation, Communication, Automotive Industry, Action Research

Paper type Research paper

Resumen

Objetivo – A gestão da inovação aberta (IA) sob uma perspectiva comunicativa tem sido um tema pouco estudado. Entretanto, estudos anteriores revelam que a comunicação poderia contribuir para a integração da dinâmica aberta, preparando as organizações para sua adoção. Por meio de um estudo realizado em uma montadora de veículos da indústria automotiva, temos por objetivo identificar as principais barreiras e os fatores determinantes que influenciam o papel da comunicação nas atividades de inovação aberta e como eles podem apoiar e melhorar a capacidade inovadora das empresas na indústria automotiva.

Desenho/Metodologia/Abordagem – Um estudo de pesquisa-ação é realizado com a participação dos pesquisadores, dos gerentes de inovação e comunicação da montadora e representantes de quatro entidades externas que participaram da dinâmica de OI realizada pela empresa. As perspectivas destas partes interessadas sobre o papel que a comunicação tem e poderia ter na gestão da inovação na indústria nos permitem desenvolver uma nova proposta de comunicação com cinco funções comunicativas que poderão ajudar as empresas a lidar com os desafios da inovação aberta.

Resultados – Observa-se que as práticas colaborativas estão integradas dentro da cultura organizacional da montadora. Em termos de colaboração, isto é realizado de acordo com as necessidades específicas da matriz, o que somado ao contexto da montadora limita o número e a especificidade das partes interessadas com as quais ela colabora. Em termos de comunicação, as funções propostas são evidenciadas na prática. Entretanto, é possível identificar a necessidade de formalizar e sistematizar estas funções e adquirir, no caso dos profissionais de comunicação, habilidades específicas para apoiar a integração de práticas abertas propostas pela IA.

Originalidade – Embora existam estudos que analisam a IA no processo automotivo, nenhum deles se concentrou em como a comunicação pode ajudar a reforçá-la. Além disso, mostramos como a comunicação pode desempenhar um papel significativo em uma montadora onde as atividades de pesquisa e desenvolvimento podem não ser importantes. Portanto, a contribuição deste estudo é dupla. Por um lado, enriquece a literatura sobre IA e, por outro lado, propõe políticas para melhorar o desempenho das práticas de IA, envolvendo a comunicação em todas as etapas.

Palabras clave Inovação aberta, comunicação, indústria automotiva, pesquisa-ação

Tipo de artículo Trabajo de investigación

Resumo

Objetivo – Identificar las principales barreras y facilitadores que influyen en el papel de la comunicación en las actividades de innovación abierta en el contexto específico de una planta de ensamblaje en la industria de automoción.

Metodología – Se lleva a cabo un estudio de investigación de acción, en el que investigadores y profesionales emprenden un proyecto en una planta de ensamblaje de automóviles. Ambos definen objetivos duales, y se describen las etapas de la metodología de investigación en acción. Dentro de este estudio, la recolección de información se realiza a través de entrevistas semiestructuradas.

Resultados – Se observa que las prácticas colaborativas se integran dentro de la cultura de la planta ensambladora. Esto se lleva a cabo de acuerdo con las necesidades específicas de la empresa, lo que limita la especificidad de los grupos de interés con los que colabora. En términos de comunicación, las funciones propuestas se evidencian en la práctica. Sin embargo, es recomendable sistematizar estas funciones y adquirir, en el caso de los profesionales de la comunicación, habilidades específicas para apoyar la integración de prácticas abiertas.

Originalidad – Aunque existen estudios que analizan la IA en automoción, el doble análisis de la comunicación y la planta de ensamblaje es original dentro del ámbito de esta literatura. La creación de un marco de referencia propio para este contexto puede ayudar a las empresas a determinar los aspectos claves para que la IA tenga una mayor relevancia en este tipo de plantas. Cabe destacar también que la utilización de la metodología de investigación en acción aporta un valor añadido y originalidad, en cuanto que fomenta las relaciones colaborativas empresa-universidad.

Palabras-chave Innovación abierta, comunicación, industria automotriz, investigación-acción

Tipo de papel Trabajo de pesquisa

1. Introduction

In several countries, the automotive industry is considered an industrial and economic force with the greatest impact on growth and development. It launches new car models with various characteristics that respond to the requirements and needs of customers and the environment, on the market yearly, in large volumes. The industry requires high capital effort, generates billions of dollars and jobs and promotes innovation through strong investment in research and development (R&D). The pressure to maintain the innovation pace, the addition of new functionalities to vehicles and the trends toward electrification and digitalization require industry manufacturers to look beyond their organizational boundaries and traditional supply chains to incorporate new players that improve their processes and maintain their competitive advantage. One challenge facing the industry is establishing relationships beyond traditional groups “such as private inventors, engineering companies and other service providers, research institutes, and competitors, for proportionate new knowledge” (Wilhelm and Dolfmsma, 2018, p. 231).

The innovation context is challenging the way companies tackle this reality, from a closed model to an open one in which collaboration with a complex and numerous grid of external partners or stakeholders (Guertler and Sick, 2021). This led earlier research, particularly in the Management discipline, to focus the attention on how companies manage their innovation projects with external actors, given the complexities it implies, for instance, for innovation performance and outcomes, organizational capabilities and knowledge absorption.

In this regard, open innovation (OI), defined as the entry and exit of intentional knowledge, “expands the range of benefits to meet challenges in order to maintain competitiveness in rapidly changing environments” (Ili *et al.*, 2010, p. 247). However, several authors have questioned whether it is possible to implement this model in a mature and conservative sector, characterized by a tendency toward closed innovation, and whether legacy car manufacturers have the capabilities and skills to implement it (Karlsson and Sköld, 2013; Lazzarotti *et al.*, 2013).

To benefit from this new model, collaboration with various external actors is crucial and challenging for companies in mature, asset-intensive sectors, such as the automotive industry, which have proven to be more resistant to changing their internal innovation processes (Chiaroni *et al.*, 2011). Migrating to an open model involves a change in mentality, whereby the industry’s capabilities are combined with those of external agents who can provide ideas and solutions that improve the innovation processes. Likewise, the development of new skills, especially those related to relationship management, is a key aspect of change (Ili *et al.*, 2010).

In this scenario, the Management discipline has mentioned the role that communication could play in supporting IO management (Trautmann and Enkel, 2014; Bruhn and Ahlers, 2017). However, this idea remains an underdeveloped aspect both in the Management and Communication disciplines themselves. Studies coming from the discipline of communication in OI are scarce as highlighted by Gutiérrez-García *et al.* (2021):

The relationship between open innovation (OI) and communication management is a neglected topic in the academic literature. Research is scarce and those that have been conducted are found in management studies, but do not focus on communication management and its processes or its specific contribution. (pp. 348–349)

Our research aims at a general objective, which is to analyze the role of communication the OI practices. We develop this aim in the specific context of the automotive industry and assembly plants. To get this, we try to answer two research questions: first, to identify the key factors that influence and determine the relevance of OI in the automotive industry, specifically when managing relationships with multiple stakeholders, and, second, how communication contribute to the OI processes in this specific context. Two research questions will be developed in the theoretical background section, showing their academic contribution to the management fields that cover this study: OI and communication.

To achieve this, we developed an action research (AR) study that can be defined as a collaborative research methodology. This type of methodology builds on the assumption that, by working closely together, researchers and practitioners can progress better and faster in understanding issues related to innovation, growth, change, organizational effectiveness and economic development (Pasmore *et al.*, 2008). Collaborative management research efforts therefore include managers' and researchers' active involvement in framing the research agenda. In collaborative management research, managers and researchers cooperate proactively in selecting and applying methods and developing implications for action. In doing so, collaborative management researchers and practitioners jointly pursue answers to questions of mutual interest through dialogue, experimentation, knowledge review and other means. The AR study was conducted at "Volkswagen Navarra," a car assembly plant in Spain which plays the role of practitioner in this study. Five stakeholders that collaborate with the firm in the OI process were included in the empirical study.

The rest of this paper is organized as follows. Section 2 reviews both OI and communication and OI and automotive industry fields. Section 3 describes the stages we have carried out in the AR methodology, including the findings and both academic and practical contributions. Finally, Section 4 presents the main conclusion, managerial implications, limitations and further research.

2. Theoretical background

Since Chesbrough (2003) introduced the concept of OI, defined as:

The use of intentional inputs and outputs of knowledge to accelerate internal innovation and expand markets for external use of innovation, respectively (Chesbrough *et al.*, 2006, p. 1), its study across various disciplines has been increasing.

The new innovation scenario, in which organizational barriers are permeable to collaboration with new actors for the exchange of knowledge, ideas, products, services and technologies, involves the development of new skills and capabilities to address changes in work dynamics. This situation enables the analysis of the relational dimension of the open model, specifically with the intention of understanding how these relationships are managed.

2.1 *Open innovation and the automotive industry*

The OI process in the automotive sector is an ongoing and evolving challenge, and its implementation has been rolled out in various ways. The industry's mentality remains closed; automobile manufacturers' knowledge flows continue to be limited to collaborations with top-level suppliers and trust centers (Dodourova and Bevis, 2014).

Traditionally, the automotive industry has not been keen on adopting OI practices. Among the barriers identified as impeding the adoption of OI are the apprehension that external ideas and technologies do not fit the company's needs, the difficulty of accepting and integrating ideas from outside and the existence of cultural and organizational barriers (Ili *et al.*, 2010). In addition, a lack of clarity exists regarding OI strategy and fear of losing control of projects, theft or appropriation of intellectual property and knowledge (Martins and Kaminski, 2019). Furthermore, no channels exist that allow all external agents, particularly small ones, to understand the sector's requirements and needs. Inventors and manufacturers speak different languages and handle different technicalities and knowledge, making it difficult to integrate new actors into the supply chain (Wilhelm and Dolfmsma, 2018). In this sector, the openness paradox may have a special relevance because "the creation of innovations often requires openness, but the commercialization of innovations requires protection" (Laursen and Saulter, 2014, p. 867). This can also explain the fact that automotive industry does not have such a proactive attitude to OI as other industries. This can be especially true in the context of assemblage plants.

Innovation in the automotive field combines several scientific disciplines to shape a final product, many of which are specific and have costs that are difficult to assume. In this regard, open practices can be useful for improving the product development process and changing the way companies are currently creating new products and technologies (Martins and Kaminski, 2019). In relation to the above, incoming practices based on the acquisition of R&D services, the application of collective intelligence, co-creation with partners and the acquisition of patents are predominant in the industry.

Implementing an OI model implies a change in mentality on how to create and benefit from external agents; and the creation of organizational structures that support open practices. This challenges car manufacturers to develop new strategies to increase R&D productivity and the exploitation of intellectual property (Ili *et al.*, 2010); and to delimit the structure defined for working with new partners, their integration, cultural change and capacity building to support knowledge inputs and outputs and the management of multiple relationships (Dodourova and Bevis, 2014; Lazzarotti *et al.*, 2013).

In short, the automotive industry's situation regarding OI should change to a more proactive attitude. Thus, there are drivers that encourage the automotive industry to develop OI policies. First, a clear trend exists in the industry toward the electrification and digitalization of cars, led by the East-Asian automotive industry (Bartnik *et al.*, 2018). This implies a change in strategies and innovation goals. Second, growing pressure to innovate requires access to new knowledge sources outside company boundaries, which involves the integration of new players and a collaborative innovation strategy (Cano-Kollmann *et al.*, 2018). Third, a trend exists of transforming organizational structures to facilitate the integration of external knowledge with suppliers, research centers or universities (Wilhelm and Dolfmsma, 2018, p. 230). Fourth, there is a scholarly consensus on the main reasons why companies within the sector are open to collaboration. These include cost reduction, shorter innovation cycle time, access to government incentives, sharing risks, accessing new technologies, intensifying customer contact, improving skills and reducing R&D costs (Schulze *et al.*, 2015; Lazzarotti *et al.*, 2013). Finally, a trend exists in OI studies in general (Huang and Rice, 2012), and in the automotive industry, in particular, of focusing on open inbound innovation practices. There is:

A tendency to look outside own boundaries for external sources to increase innovativeness (i.e., inbound openness) is confirmed, authors find that the external paths to outside the current business with own intellectual property is still hard and rare (i.e., outbound openness). (Lazzarotti *et al.*, 2013, p. 42)

Therefore, we can observe as the role of communication in the OI process has not been investigated in the scope of the automotive industry. As a relevant factor in its performance, we consider that our study permits to cover a gap in the field of OI in this sector and to encourage other researchers to develop this research line.

2.2 *Open innovation and communication*

The OI research from a communicative perspective is both scarce and narrowly framed, focusing mainly on the general concept of innovation, rather than on the specific conditions that may exist in an open context (Gutiérrez-García *et al.*, 2021). In the case of the automotive sector, the role of communicative aspects in open contexts is rarely addressed, as previously stated, with some exceptions, such as Ramírez-Portilla *et al.* (2014), who mention the importance of communicating OI initiatives to support the company's strategy and impact the different actors involved.

The integration of communication in the innovation process has been a constant feature and is difficult to grasp owing to its ubiquitous nature during the process. This explains why academic research, such as Recalde *et al.* (2022), note this novel topic is analyzed using a wide-ranging theoretical and empirical approach. On the one hand, the research is fragmented into several multidisciplinary and theoretical approaches. On the other hand, the communicative dimension of OI is a complex attribute because, as Striukova and Rayna highlight:

Open innovation can be difficult, so the implementation of the relationship with partners is critical. One of the critical issues is that this operationalization depends largely on how the relationships are developed. (Striukova and Rayna, 2015, p. 480)

In sum, the examination of the current literature, in management and communication strands, reveals two main approaches to communication in innovation. The first one focuses on communication as a tactical and dissemination function, in which information is at the center of the analysis. This is the case of Ortega-Egea *et al.* (2014), who highlight the value of the information process because it enables the sharing of ideas, and thus helps to ensure the organization's engagement with other external stakeholders. However, because "open innovation will be more extensive, more collaborative, and more engaged with a wider variety of participants" (Chesbrough, 2017, p. 38), management scholars agree that little attention has been devoted to understanding the engagement procedures with stakeholders; a theme that may bring the communication concept further consideration than mere information exchange. The management process or relationships involve more than channeling information, and its analysis enters the field of communication as a strategic function. As Elmquist *et al.* (2009, p. 339) assert, "researchers also stress that the role of management is much stronger than what is reflected in current publications."

In this regard, Zerfass and Huck (2007, p. 48) define "communication of innovation" as a "communication of innovation systematically planned, carried out, and evaluated in order to generate understanding and confidence in innovation, as well as to position the corresponding organization as innovative." However, the definition's focus is not limited to the phenomenon of OI, but also provides guidance on its strategic role in the innovation process, which could be replicated in the context of study.

Likewise, other authors point out that innovation communication at an external level helps to build an innovative image of the organization; creates trust among individuals,

organizations and industries involved in the process; dispels fears about innovation and supports the consolidation of relationships; and reduces uncertainties. Internally, the contribution is framed as creating awareness of innovation, motivating professionals to participate, consolidating an innovation culture, cross-pollinating ideas and knowledge, increasing loyalty and encouraging employee retention (Ackermann *et al.*, 2015; Linke and Zerfass, 2011; Luoma-aho and Halonen, 2010; Moenaert *et al.*, 2000).

However, although innovation communication has been described by several authors as a key factor for the success of the model, Trautmann and Enkel (2014, p. 4) point out that “neither research nor practitioners provide guidance on how companies should organize the communication of their innovation capacity.” This is reflected by the fact that no theoretical framework has yet emerged to clarify the complexity of the phenomenon from this perspective. “Until now, no coherent approach has been definitively established” (Bruhn and Ahlers, 2017, p. 207).

Few studies exist on the strategic nature of communication (Ackermann *et al.*, 2015; Enkel *et al.*, 2017; Gutiérrez-García *et al.*, 2021; Pfeffermann and Gould, 2017). Recalde *et al.* (2022) proposed a comprehensive strategic communication research agenda on OI and strategic communication. They stressed the need to further consider and explore research lines that focus on the role of communication in strategizing OI processes, involving its advisory role in decision-making. This approach is explained because the need to better comprehend engagement procedures and outcomes in OI requires strategic consideration of communication. Because relationship management entails communication, the question of how communication contributes to the dynamics of complex issues, such as environmental-scanning, stakeholder mapping and relationships enactment possess many theoretical challenges; and highlights the need for empirical studies (Recalde *et al.*, 2022, p. 85).

Considering the aforementioned approaches, the current academic literature lacks comprehensive analyses, both theoretically and empirically, of communication in OI as a multifaceted or multilayered phenomenon that deserves increased attention. In this regard, as Recalde *et al.* point out, a comprehensive understanding of how to deal with different stakeholders becomes “a delicate balancing act because it requires both managerial and communication expertise” (2022, 74). Following this line of argumentation, the following section also presents the scarce literature on this approach, specifically in the automotive industry. Consequently, the empirical findings presented in this article aim to fill the gap in the current literature to some extent.

2.3 Academic contribution and research questions

The novelty of our aim is to focus on the communication perspective from which the OI management process is addressed. Few existing studies have analyzed communication from a multilevel perspective throughout the innovation process. Another interesting aspect of this study is the case study setting; an assembly plant where product innovation is determined by the group to which it belongs. As stated in the previous section, research focusing on OI in the automotive sector is scarce and no studies based on assembly plants, to the best of our knowledge, have been found. Based on this description of OI in the automotive industry, we developed a reference framework (Table 1) that shows the barriers and drivers for OI in the automotive industry. This allows us to better understand the academic contribution of this study in two ways. First, the assembly plant has not yet been explored as a unit of analysis regarding the OI process in the automotive industry. Second, OI research in this industry has not addressed the role that communication plays in helping manage collaborative relationships with different external actors.

Our proposal seeks, to study the implementation of OI in the automotive sector based on an AR study of an assembly plant; and to assess the role of communication in facilitating

Table 1.
Barriers and drivers
for open innovation
in the automotive
industry

Barriers	• Apprehension to external ideas and technologies	Ili <i>et al.</i> (2010)
	• Cultural organizational barriers to accept ideas from outside	Ili <i>et al.</i> (2010)
	• Fear of losing control	Martins and Kaminski (2019)
	• Not sharing intellectual property and knowledge	Martins and Kaminski (2019), Laursen and Saulter (2014)
	• No adequate communication channels with external agents	Wilhelm and Dolfisma (2018)
	• Focus on inbound innovation practices	Huang and Rice (2012), Lazzarotti <i>et al.</i> (2013)
	• To build an adequate organizational structure	Ili <i>et al.</i> (2010), Dodourova and Bevis (2014)
Drivers	• Electric cars need developing new technology that comes from many fields and external sources	Bartnik <i>et al.</i> (2018)
	• Access to government incentives	Schulze <i>et al.</i> (2015)
	• Need of intensifying customer contact	Lazzarotti <i>et al.</i> (2013)
	• Tools to develop collaboration with research centers and university	Wilhelm and Dolfisma (2018)

Source: By authors

collaborative processes between plants and external stakeholders. This is summarized in the following research questions:

RQ1. What are the main barriers and drivers influencing the relevance OI practices within the specific scope of an assembly plant industry?

RQ2. How does communication contribute to the dynamics of the OI process within the specific scope of an assembly plant industry?

3. Action research study

3.1 What and why action research?

AR is a collaborative research methodology that aims to create knowledge or theory, as well as a relevant contribution to practitioners (Coughlan and Coughlan, 2002). This methodology appeared in social psychology, and the seminal papers are Collier (1945), Lewin (1946), Chein (1948) and Curle (1949). Lewin (1946) contends that the research helps the agents of the organizations and is not only dedicated to producing books. He affirmed it is necessary for both research and action to go hand in hand. Chein (1948) develops the concept of AR in

more detail and establish the four “varieties” of AR: diagnostic, participative, empirical and experimental. Finally, [Curle \(1949\)](#) adds to the earlier works that AR aims not only to discover facts, but also to help modify certain conditions considered unsatisfactory by the community. In this way, the researcher must know the results he intends to achieve and why. One of the most influential definitions of AR belongs to [Rapoport \(1970\)](#):

Action research aims to contribute to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework. (p. 499)

Thus, AR tries to understand the problems (research) and help practitioners (action) – it has a practical nature, and both the research and action are part of the process.

Furthermore, AR appeared in social psychology in the mid-1940s, and in the early 1990s, some papers in the management field ([Westbrook, 1995](#)) highlighted the specific characteristics of AR as a useful “tool” to close the gap between management “theory” and “practice.” It is evident that AR has special relevance in the field of operations management because empirical studies analyzing specific firm problems are frequent. Though, AR is a methodology used in other fields of management, such as human resources, innovation, marketing, information technology or knowledge transfer ([Erro-Garcés and Alfaro-Tanco, 2020](#)).

3.2 Action research process

Traditionally, AR studies have been conducted in several phases. Following [Coughlan and Coughlan \(2002\)](#), we defined five stages: recognition and diagnosis of the problem, action planning, action taking, assessment of results and report generation. However, the AR methodology is not a fixed process; each AR follows a unique process. Thus, AR is usually linked to “solving problems.” An AR trend is to develop studies where the practitioner’s contribution implies diagnosing or planning reports related to a specific and relevant issue for the firm/organization. [Alfaro-Tanco et al. \(2021\)](#) highlight that:

The starting point to achieve this full potential is to extend the use of AR to theory testing and theory elaboration in terms of research contribution and to produce both diagnosis and proposals with respect to the practitioners’ dimension. (p. 10)

This study presents an example in which practitioners’ contributions are based on both diagnosis and action planning. In the horizon planning of the study, the implementation stage was not the focus of the firm.

Following [Avella and Alfaro-Tanco \(2014\)](#), who describe the AR methodology in the scope of business chairs, [Figure 1](#) shows the stages carried out in this AR study, which we describe in the following sections.

3.2.1 Context of the action research study. The Chairs of Business formalize collaboration agreements between a university and a firm. [Avella and Alfaro-Tanco \(2014\)](#) developed an empirical study to show how they constitute an adequate scope to implement the AR methodology, generating relevant research in the academic field and with practical utility for the company.

Thus, this study is linked to an agreement signed by both the practitioner and the university where researchers develop their work. The main features of this study are summarized in [Table 2](#).

3.2.2 Dual objectives. The dual objectives of the project are defined as follows. On the one hand, the academic goal relates to the role of communication in OI practices and is linked to both *RQ1* and *RQ2* described in the previous section. On the other hand, in terms of the

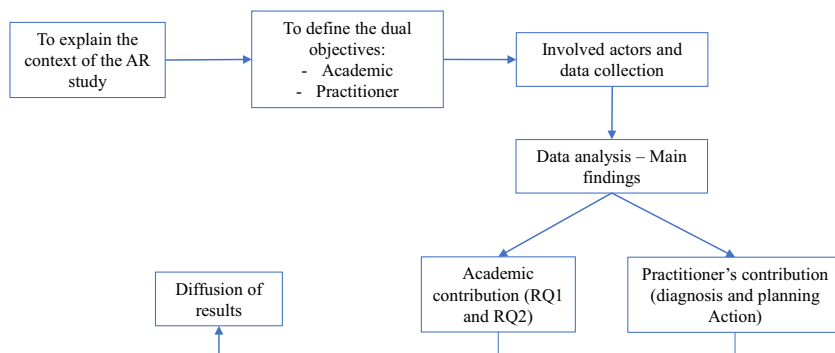


Figure 1. Action research stages in this empirical study

Title	“Analysis of communication in the open innovation processes”
Coordinator of university	Members of the research group INCOMIN
Coordinator of practitioner	Head of communication of the assembly plant
Duration	One year: 2019–2020

Table 2. Main aspects of the action research project

Source: By the authors

practitioner, it aimed to diagnose the role of communication in the OI processes and determine a list of planning actions to reinforce its role.

3.2.3 Involved actors and data collection. As noted above, the assembly plant (the practitioner) was chosen as the case study for empirical analysis. Considering the above, to understand how OI is implemented in the plant, we selected four strategic partners with which collaborative relationships are maintained. The criteria outlined by [Lazzarotti et al. \(2013\)](#) were used to identify three stakeholder categories: business partners, knowledge agents and public institutions and civil society organizations.

The sample selection responds first to the objective of studying the implementation of OI in the automotive sector and its collaborative relationships with different strategic partners. The latter were selected based on the degree of collaboration with the plant and success achieved in the processes already underway. Finally, four firms/organizations were chosen: a start-up, regional cluster, business chair and an incubator of firms. Hereafter, we use the “general concept” for each of them. In [Appendix](#), the features and real names of each can be found.

For data collection, a semi-structured interview design was chosen to have more flexibility in addressing key issues and to allow interviewees to propose ideas and topics ([Merriam and Tisdell, 2016](#); [Mikecz, 2012](#)). Ten interviews were conducted with innovation and communication managers and external partners. The first ones provide a perspective on how the innovation process is organized, planned and carried out, and how communication is integrated. The second offer an external view of how the innovation process is carried out, how relationships with collaborators are managed and the factors and barriers that influence this management. Both perspectives help to identify the role of communication within the innovation process.

Two questionnaires were used with the objective of leading the discussion and weighing the evaluation factors described in the aims and research questions, one for companies and the other for stakeholders, which were sent in advance. Three dimensions were considered

for the questionnaires: innovation management, the role of communication and the factors and barriers that enhance and influence their participation. The interviews lasted approximately 1 h and were conducted by two researchers from the group to compare notes. The data collection lasted one month – mid-May and June 2019 – and the findings obtained were subsequently transcribed and reviewed by the three investigators, which allowed the comparison of notes, reassertion or rejection of hypotheses and validation of conclusions.

3.2.4 Data analysis – main findings. From the mainstream literature on OI, as well as in the specialized literature on the automotive sector, the role of communication in the management and implementation of OI practices emerge. This is reaffirmed by Volkswagen Navarra and its stakeholders, who recognize the key role it plays in the success of an OI strategy.

The interviews allowed us to identify the OI practices carried out by the assembly plant with their stakeholders (identified above), the goals of each collaboration and the role that each stakeholder believes communication has or should have in OI. The findings are summarised in [Table 3](#).

Regardless of the conditions that determine the type of OI that takes place at Volkswagen Navarra, the most common OI practices are the couple-type; the coupled practices referred to by the stakeholders interviewed are presented in [Table 4](#).

Openness to these types of collaboration stems from the OI process initiated by the company seven years ago as part of a change in the group's strategy. The collaborative experiences between the different stakeholders and Volkswagen Navarra have allowed us to identify the role that communication currently plays in OI processes, and the capabilities that each actor believes should be acquired to facilitate the implementation of this new model. The manager who was in charge of implementing this strategy in the plant emphasized that:

We were conscious that communication played a relevant role not only in the role of spreading the final results of OI activities if not in all the stages of the process. For example, it is common for many stakeholders to have as a reference for collaboration to the Head of Communication and not so much the Innovation department. This shows the importance of this function and department in our OI strategy.

In the case of the plant, the communication action is aimed at communicating innovation activities and, in certain cases, involves identification and contact with external stakeholders. However, there is no systematization or specific definition of the role played by communication in the OI process. Regarding collaborative relationships, the role of communication varies according to partner type. In the case of the suppliers, the relationship mostly focuses on obtaining a service.

Clusters focus on networking, acting as intermediaries between companies and start-ups. In this specific case, communication assumes a managing relational role, oriented toward fostering relationships, connecting people and generating activities that promote contact between those who have problems and those who can provide solutions. So, the representative of the automotive cluster highlighted that:

Communication is crucial to build collaborative innovation activities in our sector. To develop effective channels of communication and to standardise its role in each stage help to improve both the speed and efficiency of the process.

In the case of the start-up, the success of collaboration with companies depends on the fluidity of communication, where an intermediary is considered key to connecting both ecosystems. Similarly, the ability to motivate and keep innovation projects active throughout their stages involves all actors, generates knowledge, and breaks down barriers and is also seen as aspects of communication's role.

Stakeholders	Goals	Role of communication
Start-up	<ul style="list-style-type: none"> *Development of technological innovations for process improvement 	<ul style="list-style-type: none"> * To motivate and keep the innovation process alive in all its stages * To generate knowledge (internal and external), dispel fears * To involve all actors (internal and external) * To break down barriers * To support learning from stakeholders involved in the process * Knowledge tool for start-ups
Regional cluster	<ul style="list-style-type: none"> *Trend observatory *Source of knowledge * Intermediary for knowledge transfer 	<ul style="list-style-type: none"> * To share innovation and generate knowledge * Relational: connecting people, networking between companies and start-ups, empowering networking * Knowledge tool for cluster
Business chair	<ul style="list-style-type: none"> *Development of research projects based on collaborative research methodology to offer solutions to real problems in different areas of the company 	<ul style="list-style-type: none"> * To create and promote an openness culture * To facilitate collaborative relationships * To establish a common scenario that prevents language and cultural barriers
Incubator of firms	<ul style="list-style-type: none"> *Trend observatory *Source of knowledge through mediation between the company and start-ups *Development of start-ups *Advice in the implementation of open innovation strategy (consultant role) 	<ul style="list-style-type: none"> * To visualize innovation * To enhance visibility and foster innovation * To monetize innovation through communication of results) * To create and promote an openness culture * To sensitize and raise awareness of the benefits of open innovation internally * To support learning from stakeholders in the innovation process * To facilitate the relationship between the company and start-ups * To publicize the benefits, results, profits of innovation of start-ups

Source: By the authors

Table 3.
Goals, practices and the role of communication in the open innovation process

Table 4.
Collaborative
practices among the
assembly plant and
external actors

Stakeholders	Collaborative practice
Start-up	<ul style="list-style-type: none"> • Development of voice control technology • Virtual reality glasses
Regional cluster	<ul style="list-style-type: none"> • Virtual classroom 4.0 for training workers in new technologies
Business chair	<ul style="list-style-type: none"> • Joint research projects with AR methodology
Incubator of firms	<ul style="list-style-type: none"> • Consultancy • Development of an open innovation manual • Open innovation day • Promote, coordinate and implement the open innovation program among firms and start-ups located in the vivarium • Training of managers in innovation topics

Source: By the authors

As a source of knowledge through the relationship between an academic institution and an enterprise, communication function collaborates in the construction of a common framework that allows collaborative activity between academic and business worlds.

Finally, regarding the incubator of firms – acting as an intermediary – the role of communication is geared toward visualizing the advantages and benefits of OI, fostering collaboration and creating a culture of openness. They provide a communication platform that facilitates interaction between companies and start-ups.

3.2.5 Academic contribution

RQ1. What are the main barriers and drivers influencing the relevance OI practices within the specific scope of an assembly plant industry?

Taking [Table 1](#) as a reference framework, some reflections can be made on the assembly plant we have analyzed. First, we observe that even [Ili et al. \(2010\)](#) identified both apprehension to external ideas and technology and lack of cultural organizational, the empirical research did not identify any of them. We consider three possible reasons: [Ili et al. \(2010\)](#) was published more than 10 years ago; so, there has been a growing trend in the automotive industry to be keener on opening to external knowledge. The second reason is the fact that this is especially true for assembly plants, which have close contact with stakeholders such as suppliers, research centers and universities. These same two arguments are valid for not including the fear of losing control and not sharing intellectual property and knowledge as barriers for the assembly plant. Besides, because of their influence on local economies, governments give these plants incentives to develop networks that facilitate collaboration, which is one of the drivers of [Table 1](#) and identified by [Schulze et al. \(2015\)](#). In this way, the relationship with the interviewed stakeholders comes from initiatives organized by the assembly plant to generate ideas to develop innovation improvements. Thus, the development of tools to conduct collaborative activities, such as cited by [Wilhelm and Dolfmsa \(2018\)](#), is also crucial for assembly plants. Access to funds through national and international projects is a way to deploy OI practices, such as [Schulze et al. \(2015\)](#) also highlighted.

One relevant aspect to emphasize is that studies such as [Huang and Rice \(2012\)](#) and [Lazzarotti et al. \(2013\)](#) showed that automotive industry focused on inbound practices, we

have been able to identify coupled ones, such as the developed with the start-up and the business chair. This a proof that the culture of the plant is oriented to collaboration. It is also important to highlight that there is no standardized process nor adequate communication channels to design and develop OI activities. Thus, the first aspect is related to the need to build an adequate organizational structure.

In terms of drivers, the ones presented in Table 1 pertain to the analyzed assembly plant. In addition, we could add one additional driver: the assembly plant is located in a small town and in a very specific geographical and political context. The assembly plant, as the biggest firm and employer of the region, implies that it is an influential actor in the local community and therefore engaged in multiple socioeconomic activities. Thus, its position as a key local player reinforces the firm’s attitude toward OI. Figure 2 summarizes this “adapted framework” for the specific case we have analyzed.

RQ2. How does communication contribute to the dynamics of the OI process within the specific scope of an assembly plant industry?

Because of the aforementioned aspects analyzed, it can be said that communication may have diverse roles in OI processes that extend beyond information delivery. Based on the capabilities and characteristics identified by the stakeholders, the following roles emerged, as specified in Figure 3.

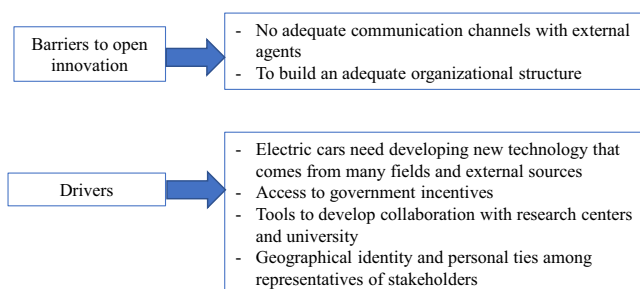


Figure 2. Barriers and drivers for open innovation in the analyzed assembly plant

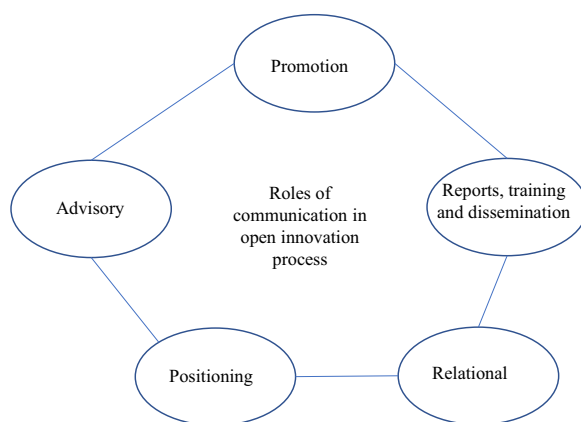


Figure 3. Roles of communication in open innovation process

It is possible to observe how the proposed roles meet the functions described in the theoretical background section, where some potential contributions of communication in OI are presented. Besides responding to the needs mentioned, the different professionals interviewed on how communication should favor the implementation, acceptance and development of the OI model.

The proposal also describes its support for the management of the relational dimension by integrating, identifying and connecting different actors involved in the open ecosystem. This helps identify potential alliances, creates an environment conducive to collaboration based on trust, dispels several fears about the implications of the process and strengthens the relationship through continuous communication that meets the needs and requirements of internal and external stakeholders.

Similarly, its strategic role in advisory activities for the company's managers is highlighted. This is evidenced in the detection of trends, opportunities and risks that nurture decision-making in the alignment of corporate strategy with the communication strategy to promote the integration, understanding and implementation of the model. On the one hand, the professionals interviewed emphasized the importance of positioning the organization as innovative; communicating the projects, awards received and forums in which they participated. On the other hand, external stakeholders who collaborate with Volkswagen emphasized the importance of communicating collaborative projects, especially successful ones, as they contribute to their positioning in the innovative ecosystem. Establishing them as valid and competent agents to be considered by other companies for further collaboration.

It also supports the promotion of the OI process, generating internal knowledge about its nature and impact, to promote the participation of internal professionals in collaborative dynamics with the outside world. At the same time, it communicates to external agents their willingness to open their processes to external collaboration. This raises awareness and gives dynamism to the innovation process, and builds a culture oriented toward collaboration, by managing the attitudes and behaviors of stakeholders so that they are favorable to openness.

Finally, its informative, formative and disseminative roles help generate knowledge about the process, which supports change management and favors the learning of stakeholders about what the adoption of OI entails. This is materialized by making innovation visible, transmitting its benefits, making results tangible and demystifying the causes that impede stakeholder participation.

3.2.6 Practitioner's contribution. In terms of the practitioner's contribution, the main output was a report with a diagnosis and planning actions to reinforce the role of communication in the OI process. The action planning incorporated most of the academic contribution findings. Thus, the Department of Communication was encouraged to play a relevant role in monitoring the innovation process, systematizing the OI stages, and developing tools and performance indicators to analyze the social impact of OI activities.

To communicate in open contexts, it is necessary to understand the implications of the model to adapt the functions according to the different actors' needs. In other words, it is necessary to innovate according to the way innovation is communicated. Regarding the above, to influence management and decision-making around innovation, it is necessary to formalize and systematize the operational and strategic functions of communication, thus favoring the internal legitimization process, making it a valid and key actor in the process. Although the findings demonstrate the importance of communication, most times the lack of training, orientation or attention to this factor within organizations hinders professional exercise.

3.2.7 Diffusion and learning. The outputs were presented in webpages, academic conferences and open sessions directed to both academic and practitioners. A preliminary version was presented at an international conference of Management and also in the regular sessions of the Business Chair the results were presented. All the involved actors were reported about the results and they all gave the information consent for this paper.

4. Conclusions: managerial implications and further research

Regardless of the reasons that motivate the adoption of OI, collaboration seems to be one of the most important challenges faced by every organization that adopts this model. Through collaboration, they integrate and interchange knowledge with the different actors in an innovative ecosystem. This article has focused its analysis on the verge of innovation management and strategic communication. Although this remains a gap in the literature, the findings of the case study allow us to conclude that communication as a strategic tool has the potential to overcome the challenges of the relational complexities in OI. However, as the case study shows, there is a widespread need for enhancing the strategic role of communication, to define and clarify internally its potential. From an academic research perspective, there is room for researching the theoretical constructs that lie behind the operationalization of communication as a strategic tool.

The aforementioned features manifest that both theory and practice, the communicative function in the OI model has been conceptualized as an information-delivering or dissemination role. However, as the literature review and case study presented in this article show, further consideration should be considered in both academia and the practitioner fields. On the one hand, academic research needs to fill the theoretical gap that entails considering communication roles throughout the process, which expands its dissemination role toward a strategic and advisory role in managing stakeholder relationships. The scarce research antecedents present an opportunity for academia. Academic research faces the challenge of broadening the comprehension of communication, because the management of external stakeholders' relationships is at stake.

Following, we develop the managerial implications of this study and further research.

4.1 Managerial implications

One of the main contributions of this paper is to develop a case study based on a unity of analysis that has been few studied in the OI research of automotive industry: the assembly plants. We consider that [Figure 3](#) is a reference framework that may be generalized to this type of facilities and that may help them to build an innovation strategy that considers these specific factors. In this way, one of the main characteristics of this type of facility is that their economic influence in the region they are located in is very high. This is especially relevant in terms of the relationships they hold with their stakeholders and, therefore, this is a relevant factor to promote OI practices. Because of this, to include stakeholders in the empirical research is relevant for this study and it shows that assembly plants have to consider them when developing an innovation strategy. This is even more relevant, if we consider the fact that these plants have to face the challenge that imply the arrival of the electric car. To determine which electric models, they will be assigned many times that they do not only have to compete with other brands if not with other assembly plants of the same company. The ones that are stronger in developing OI practices will be able to be more efficient and here the five roles of communication in OI processes are crucial to determine the future of assembly plants in the future.

Finally, we want to highlight how to work with AR, a collaborative research methodology, helps to reinforce university–firm relationships and we encourage researchers in management to use this in applied practice to reinforce the impact of their studies.

4.2 Further research and limitations

Further research on communication’s potential contribution to decision-making in OI processes might consider key features, such as relationships taxonomy and conceptualization, the comprehension of relationships management operationalization or how the definition of corporate innovation culture expands in OI contexts. These are among the key topics for further research.

As the case study illustrates, the roles described allow us to study the role of communication as a facilitator of the OI process. Nonetheless, in the absence of a clear systematization and definition of the communication functions, more research is needed. As mentioned earlier, studies on OI from a communicative perspective are scarce and pose multiple challenges.

Finally, aware of this study’s limitations in taking as a sample, a concrete reality of a specific industry, it would be interesting to apply this research to other sectors and organizational realities and verify whether these roles are valid and sufficient to meet the communication needs of companies in open contexts. In this sense, the opportunities to draw lines of research on this topic are broad and enrich the field of communication and innovation management.

This profession faces challenges similar to those mentioned above. It can be said that a narrow conception of communication as only a dissemination role might constrain the potential of the communication function. It may also serve an advisory role, an environmental-scanning analysis that might enrich the decision-making process when focusing on the potential of relationship management as a key aspect in OI process performance and outcomes.

References

- Ackermann, M.S., Stephan, M. and Penrose, J.M. (2015), “Assessing organizational innovativeness – evidence from corporate narratives”, *Corporate Communications: An International Journal*, Vol. 20 No. 4, pp. 399-414.
- Alfaro-Tanco, J.A., Avella, L., Moscoso, P. and Näslund, D. (2021), “An evaluation framework for the dual contribution of action research: opportunities and challenges in the field of operations management”, *International Journal of Qualitative Methods*, Vol. 20, pp. 1-16.
- Avella, L. and Alfaro-Tanco, J.A. (2014), “Spanish university business chairs used to increase the deployment of action research in operations management: a case study and analysis”, *Action Research*, Vol. 12 No. 2, pp. 193-207.
- Bartnik, R., Wilhelm, M. and Fujimoto, T. (2018), “Introduction to innovation in the East Asian automotive industry: exploring the interplay between product architectures, firm strategies, and national innovation systems”, *Technovation*, Vol. 70-71, pp. 1-6.
- Bruhn, M. and Ahlers, G.M. (2017), “Integrated communication in the innovation process—an approach to integrated innovation communication”, in Pfeffermann, N. and Gould, J. (Eds.), *Strategy and Communication for Innovation. Integrative Perspectives on Innovation in the Digital Economy*, Springer International Publishing, Berlin, pp. 205-225.
- Cano-Kollmann, M., Awate, S., Hannigan, T.J. and Mudambi, R. (2018), “Burying the hatchet for catch-up: open innovation among industry laggards in the automotive industry”, *California Management Review*, Vol. 60 No. 2, pp. 17-42.

-
- Chein, I. (1948), "The field of action research", *The American Psychologist*, Vol. 3 No. 2, pp. 43-50.
- Chesbrough, H.W. (2003), "The era of open innovation", *MIT Sloan Management Review*, Vol. 44 No. 3, pp. 35-41.
- Chesbrough, H.W. (2017), "The future of open innovation", *Research-Technology Management*, Vol. 60 No. 1, pp. 35-38.
- Chesbrough, H.W., Vanhaverbeke, W. and West, J. (2006), *Open Innovation: Researching a New Paradigm*, Oxford University Press, Oxford.
- Chiaroni, D., Chiesa, V. and Frattini, F. (2011), "The open innovation journey: how firms dynamically implement the emerging innovation management paradigm", *Technovation*, Vol. 31 No. 1, pp. 34-43.
- Collier, J. (1945), *Social Research/an International Quarterly of Social Sciences*, Graduate Fac, New York, NY.
- Coughlan, P. and Coughlan, D. (2002), "Action research for operations management", *International Journal of Operations and Production Management*, Vol. 22 No. 2, pp. 220-240.
- Curle, A. (1949), "A theoretical approach to action research", *Human Relations*, Vol. 2 No. 3, pp. 269-280.
- Dodourova, M. and Bevis, K. (2014), "Networking innovation in the European car industry: does the open innovation model fit?", *Transportation Research Part A: Policy and Practice*, Vol. 69, pp. 252-271.
- Elmqvist, M., Fredberg, T. and Ollila, S. (2009), "Exploring the field of open innovation", *European Journal of Innovation Management*, Vol. 12 No. 3, pp. 326-345.
- Enkel, E., Dingler, A. and Mangels, C. (2017), "Open innovation: enhancing theory and practice by integrating the role of innovation communication", in Pfeffermann, N. and Gould, J. (Eds), *Strategy and Communication for Innovation. Integrative Perspectives on Innovation in the Digital Economy*, Springer International Publishing, Berlin, pp. 131-145.
- Erro-Garcés, A. and Alfaro-Tanco, J.A. (2020), "Action research as a meta-methodology in the management field", *International Journal of Qualitative Methods*, Vol. 19, pp. 1-11.
- Guertler, M.R. and Sick, N. (2021), "Exploring the enabling effects of project management for SMEs in adopting open innovation projects", *International Journal of Project Management*, Vol. 39 No. 2, pp. 102-114.
- Gutiérrez-García, E., Recalde, M. and Alfaro, J.A. (2021), "Corporate communication in open innovation: a case-study of three multinationals", *Corporate Communications: An International Journal*, Vol. 26 No. 2, pp. 348-364.
- Huang, F. and Rice, J. (2012), "Openness in product and process innovation", *International Journal of Innovation Management*, Vol. 16 No. 4.
- Ili, S., Albers, A. and Miller, S. (2010), "Open innovation in the automotive industry", *R&D Management*, Vol. 40 No. 3, pp. 246-255.
- Karlsson, C. and Sköld, M. (2013), "Forms of innovation openness in global automotive groups", *International Journal of Automotive Technology and Management*, Vol. 13 No. 1, pp. 1-17.
- Laursen, K. and Sautter, A.J. (2014), "The paradox of openness: appropriability, external search and collaboration", *Research Policy*, Vol. 43 No. 5, pp. 867-878.
- Lazzarotti, V., Manzini, R., Pellegrini, L. and Pizzurno, E. (2013), "Open innovation in the automotive industry: why and how? Evidence from a multiple case study", *International Journal of Technology Intelligence and Planning*, Vol. 9 No. 1, pp. 37-56.
- Lewin, K. (1946), "Action research and minority problems", *Journal of Social Issues*, Vol. 2 No. 4, pp. 34-46.
- Linke, A. and Zerfass, A. (2011), "Internal communication and innovation culture: developing a change framework", *Journal of Communication Management*, Vol. 15 No. 4, pp. 332-348.
- Luoma-Aho, V. and Halonen, S. (2010), "Intangibles and innovation: the role of communication in the innovation ecosystem", *Innovation Journalism*, Vol. 7 No. 2, pp. 2-20.

- Martins, M.B. and Kaminski, P.C. (2019), "Differences in open innovation practices between headquarters and subsidiaries in the automotive industry: the French case", *Cogent Engineering*, Vol. 6 No. 1.
- Merriam, S.B. and Tisdell, E.J. (2016), *Qualitative Research: A Guide to Design and Implementation*, 4th ed., Jossey Bass, San Francisco, CA.
- Mikecz, R. (2012), "Interviewing elites: addressing methodological issues", *Qualitative Inquiry*, Vol. 18 No. 6, pp. 482-493.
- Moenaert, R.K., Caeldries, F., Lievens, A. and Wauters, E. (2000), "Communication flows in international product innovation teams", *Journal of Product Innovation Management*, Vol. 17 No. 5, pp. 360-377.
- Ortega-Egea, M.T., Ruiz Moreno, A. and Haro Domínguez, M.C. (2014), "Determinants of innovative behavior of employees: evidence from Spanish firms", *Employee Relations*, Vol. 36 No. 6, pp. 606-621.
- Pasmore, W.A., Stymne, B., Shani, A.B.R., Mohrman, S.A. and Adler, N. (2008), *Handbook of Collaborative Management Research*, Sage Publications, London.
- Pfeffermann, N. and Gould, J. (2017), "Strategy and communication for innovation", *Integrative Perspectives on Innovation in the Digital Economy*, Springer International Publishing, Berlin.
- Ramirez-Portilla, A., Brown, T. and Cagno, E. (2014), "Open Innovation in the Automotive Industry: what can carmakers' annual reports tell us?", paper presented at The 8th International Conference on Industrial Engineering and Industrial Management-CIO-ICIEOM-IIIIE, 23rd-25th July, Malaga (Spain).
- Rapoport, R.N. (1970), "Three dilemmas in action research: with special reference to the Tavistock experience", *Human Relations*, Vol. 23 No. 6, pp. 499-513.
- Recalde, M., Gutiérrez-García, E. and Yáñez-Galdames, M.J. (2022), "A relational dimension of open innovation: towards a comprehensive strategic communication research agenda", *International Journal of Strategic Communication*, Vol. 16 No. 1, pp. 70-90.
- Schulze, A., Paul MacDuffie, J. and Täube, F.A. (2015), "Introduction: knowledge generation and innovation diffusion in the global automotive industry-change and stability during turbulent times", *Industrial and Corporate Change*, Vol. 24 No. 3, pp. 603-611.
- Striukova, L. and Rayna, T. (2015), "University-industry knowledge exchange, an exploratory study of open innovation in UK universities", *European Journal of Innovation Management*, Vol. 18 No. 4, pp. 471-492.
- Trautmann, K. and Enkel, E. (2014), "Success factors for strategic communication of corporate innovativeness for financial analysts", *International Journal of Innovation Management*, Vol. 18 No. 1, pp. 1-46.
- Westbrook, R. (1995), "Action research: a new paradigm for research in production and operations management", *International Journal of Operations and Production Management*, Vol. 15 No. 12, pp. 6-20.
- Wilhelm, M. and Dolfmsa, W. (2018), "Managing knowledge boundaries for open innovation-lessons from the automotive industry", *International Journal of Operations and Production Management*, Vol. 38 No. 1, pp. 230-248.
- Zerfass, A. and Huck, S. (2007), "Innovation, communication, and leadership: new developments in strategic communication", *International Journal of Strategic Communication*, Vol. 1 No. 2, pp. 107-112.

Further reading

- Chetty, S. (1996), "The case study method for research in small-and medium-sized firms", *International Small Business Journal: Researching Entrepreneurship*, Vol. 15 No. 1, pp. 73-85.

Geffen, C.A. and Rothenberg, S. (2000), "Suppliers and environmental innovation: the automotive paint process", *International Journal of Operations and Production Management*, Vol. 20 No. 2, pp. 166-186.

Sovacool, B.K., Rogge, J.C., Saleta, C. and Masterson-Cox, E. (2019), "Transformative versus conservative automotive innovation styles: contrasting the electric vehicle manufacturing strategies for the BMW i3 and fiat 500e", *Environmental Innovation and Societal Transitions*, Vol. 33, pp. 45-60.

Appendix

1. Involved actors

1.1 Assembly plant – Volkswagen Navarra

The Volkswagen Navarra Assembly Plant plays the role of PRACTITIONER in the action research study. It is a major player in the regional economy. It employs 4,877 workers (2019), and each worker contributes 67 cars per year to the factory's overall production. Every day, 80–100 trucks and 3–4 trains depart with cars from the plant. In total, 91% of its production is exported to over 40 countries, with Germany Italy, and France being the main recipients (according to 2019 data made available by Volkswagen Navarra).

1.2 Start-up – TedCas Medical Systems

TedCas (<http://tedcas.com>) is a PROVIDER for Volkswagen Navarra. Start-up that offers technological solutions to the health-care sector by developing technologies for accessing and managing medical information through contactless natural user interfaces. Despite its business niche in health care, it has adapted its technological solutions to other sectors, such as the automotive industry, where it actively collaborates with Volkswagen Navarra. It should be noted that its relationship with the factory began in 2016, following the Open Innovation Day organized by Volkswagen Navarra and the European Centre for Business and Innovation in Navarra (CEIN), aimed at generating new projects through collaboration strategies. To date, two specific collaborative actions have already been carried out, and further details are provided below.

1.3 Regional cluster – Automotive Industry Cluster in Navarre

Automotive Industry Cluster in Navarre (in Spanish, ACAN; <http://clusterautomocionnavarra.com/>) is a private nonprofit entity launched in 2011 as a cooperation space for industries and technology centers within Navarre. The remit includes education, training, knowledge, services and technology. This cluster seeks to promote competitiveness, employment and company turnover among association members, and thus, the automotive sector and the economy of the region. Its main role is to be an INTERMEDIARY OF INNOVATION.

It comprises 56 companies (August 2021) – multinationals, large companies, SMEs and micro-SMEs – amounting to one-third of the companies in the sector. Volkswagen Navarra, a vehicle manufacturer, is a member of the ACAN. It finances its activities through the membership fees of its partners and the support of the regional government of Navarre.

1.4 Business chair – Business Chair Volkswagen Navarra – Universidad de Navarra

The chair (www.unav.edu/web/catedra-empresa-volkswagen) is the consolidation of an academic business agreement between Volkswagen Navarra and the University of Navarra, whose aim is to sustain a collaborative relationship in joint projects of interest to both parties. The first agreement was signed in 1998 focusing strongly on quality (a key factor in an assembly plant), which was the

main driver of cooperation for the first 10 years of this partnership, contributing to both research and teaching, university quality subject funding and doctoral fellowships to address the specific topic, and the promotion of courses and seminars. From 2010 onward, the scope of the chair has broadened beyond quality to encompass other departments at the factory (logistics, human resources, computer systems, etc.). Its main role is to be the mechanism that permits to develop COLLABORATIVE RESEARCH PROJECTS between Volkswagen Navarra and University of Navarra.

1.5 Incubator of firms – European Center for Business and Innovation in Navarra

CEIN (www.cein.es) is a public nonprofit company that depends on the vice presidency of economic development of the regional government of Navarre and its main role is to ENHANCE ENTREPRENEURIAL INITIATIVES AND SUPPORT THE CREATION OF NEW COMPANIES. They focus on entrepreneurship, innovation, growth and collaboration. Its work in the region has enabled the creation of 2,932 companies, generation of 5,892 jobs, incorporation of 207 companies into its innovation vivarium and participation of 40,700 university and professional/apprenticeship-training students in entrepreneurship activities.

The relationship with Volkswagen began In 2013, when training and advisory sessions were held to manage the implementation of open innovation at the plant. Subsequently, CEIN BECAME AN INTERMEDIARY BETWEEN THE FACTORY AND START-UPS INSTALLED IN ITS VIVARIUM TO PROMOTE COLLABORATION IN INNOVATION PROJECTS. An example of a success in this regard is TedCas.

Corresponding author

José A. Alfaro-Tanco can be contacted at: jalfaro@unav.es