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The Human Dimension of Open Innovation: Structured Literature Review

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Abstract: *The concept of open innovation was first introduced in 2003 by Henry Chesbrough. Research on this topic has been pursued, observing the subject from different angles and integrating it into different scientific fields. However, the "human side" of open innovation is still understudied; hence, there is a need to link open innovation with HRM. The aim of this paper is then to find out what has already been done in this field (the contributions of the various studies undertaken) and what remains to be achieved (perspectives for future research). To do this, a structured literature review on the subject was conducted.*

Keywords: *Open innovation, Human resources management, Structured literature review.*

1. INTRODUCTION

In the world characterized by high international competition and a changing environment, innovation becomes essential for a company to maintain and develop its positions. Nowadays, innovation is not more seen as an individual process, but as a collaborative one. A talented person may have a genius idea, however to implement it the involvement of the entire team from the lowest level to senior management is required. Moreover, this talented person may not work for the company and be part of its staff. Therefore, to attract innovative ideas, a company should welcome external knowledge. Within this context, the open innovation concept introduced in 2003 by Henry Chesbrough is worth thorough attention and deep studying. The collaborative innovation process is accompanied by company's outbound openness. The company is therefore expected to work with all its stakeholders. This implies that the company acquires new knowledge from its external partners and later on integrates it by combining with internal knowledge. This process can directly involve all the individuals in a company who obviously interact, analyze situations, suggest ideas, share knowledge, and assimilate it. Thus, the role of human resources management seems to be crucial for the company involved in the open innovation process. Although the concept was first introduced in 2003, few scientific papers linking open innovation with HRM have been published. This observation is confirmed by analysis of the best-cited scientific papers published over the last fifteen years which summarize the literature on open innovation. The authors of these papers underline the emergence of HRM challenges induced by collaborative innovation process and note the existence of the knowledge gap for this purpose. Moreover, several articles mention explicitly human resource management as an important field of study for future research on open innovation ((Elmquist et al., 2009 [11]), (Vrande et al., 2010 [33]), (Schroll and Mild, 2012 [31]), (Hossain and Anees-ur-Rehman, 2016 [15])). This fact has prompted us to take a closer look in this subject and to conduct a literature review in order to find out what has already been accomplished and to identify the perspectives for future research. This paper proceeds as follows. In the next section we will describe the methodology used to conduct the literature review, notably the structured literature review. Then, the results will be detailed and analyzed. Some limitations of this work will be noted in the section 4 revealing the directions for future research. Finally, we'll conclude with a summarized overview of the article.

2. METHODOLOGY

Unlike narrative or synthetic literature review, the Structured Literature Review (SLR) is characterized by the rigidity of its rules. Therefore, it is supposed to be more reliable and to procure less biased results. This paper is based on the methodology of SLR proposed by (Massaro et al., 2016 [20]). Notably, ten steps were undertaken as follows:

Step 1: Write a literature review protocol

The first step is to write a protocol and to describe explicitly the procedure followed conducting the literature review.

Questions of the literature review:

• What studies on HR dimension of open innovation have been conducted up to date and how did the research on the subject develop over time?

• What contributions have these studies made?

• What are knowledge gaps and future research perspectives?

Method used: Structured Literature Review.

Types of studies: scientific papers published in journals referenced in online databases Scopus and Google Scholar.
How these studies will be evaluated and synthesized: by codifying the units of analysis and by constructing the summary tables.

Step 2: Define the questions that the literature review is setting out to answer

The three main questions identified in Step 1 were transformed into a multitude of questions:
What is the total number of scientific papers published ?

- How was the number of articles on the subject changing over time?
- What is the repartition of the papers by research approaches used (qualitative, quantitative, mixed)?
- In what countries empirical research on the subject has been done?
- What is the scientific impact of these papers, and who are the most influential authors in the field?
- What is the share of articles published in scientific journals specializing in HRM?
- What are the main topics covered in these scientific papers?
- What are the epistemological positions of the authors?
- What theories the authors have been based on?
- What scientific variables were studied in quantitative researches?
- What methods of collecting and analyzing empirical materials did the authors used?
- What are the knowledge gaps and the scientific needs to date?
- What are the possible directions for future research?

Step 3: Determine the type of studies and carry out a comprehensive literature search

According to the methodology of SLR, there is a need to clearly explain the procedure of literature searching so that other researchers may undertake thereafter the same literature review and compare the results. As linking open innovation to HRM is an emerging topic, scientific papers published in this regard are still scarce. Thus, among four methods of literature searching proposed by (Massaro et al., 2016 [20]), we have chosen "a keyword search in a particular field". This approach allows to get the most complete view on the subject and to have no paper missing. Moreover, for enriching the results we have also researched the papers from international conferences on the subject. Scopus was used first, since it is a relevant database respected by scientists which contains articles from indexed (peer reviewed) scientific journals and allows researching the paper by the words in its title, abstract or keywords. In addition, Scopus offers the possibility of perfecting the search via "advanced parameters" option, as well as restricting the field of articles by "limit the choice to" function. First, the combination of keywords “Open innovation” + “HRM” has been tested. Using the “advanced parameters” option, the “Business, Management and Accounting” field was selected. This attempt resulted in 16 relevant scientific papers found. As 16 is not a sufficient number of articles for serious literature review, a modification of the keywords was necessary in order to obtain more results and to continue our research. Thus, the combination of keywords “Open innovation” + “human resource” searched in the journals of “Business, Management and Accounting” field resulted in 132 papers found.
The search field was further expanded by introducing the following combinations as keywords:

- « open innovation » + « HRD » ;
- « open innovation » + « employee » ;
- « open innovation » + « competences » ;
- « open innovation » + « skills » ;
- « open innovation » + « recruitement » ;
- « open innovation » + « training »;
- « open innovation » + « rewards »;
- « open innovation » + « motivation ».

As the number of papers found in this way was still not enough to carry out a literature review, it was decided to complement the results by Google Scholar. Thus, the same combinations of keywords were used in the second database. Indeed, Google Scholar is a free scientific search engine that lists the articles from indexed journals, but also non-indexed sources, such as practitioner magazines, government documents and newspapers. As Google Scholar searches documents by keywords situated at any point of the article (and not only in title or abstract), the results found were much more numerous. Therefore, we limited the scope to 15 pages first displayed. The summaries of all the papers found in two databases were read, which enabled us to eliminate the articles not corresponding to our purposes and to select only the most relevant ones. The final results can be summarized as follows:
Table1. Number of relevant articles found by keyword combinations

	Scopus	Google Scholar
"open innovation" + "HRM"	5	5
"open innovation" + "human resource"	4	non relevant
"open innovation" + "HRD"	1	non relevant
"open innovation" + "skills"	1	non relevant
"open innovation" + "competences"	1	1
"open innovation" +"recruitment"	1	non relevant
"open innovation" + "training"	3	non relevant
"open innovation" + "employee"	2	non relevant

total par BDD	18	6
total des BDD	24	

Source : Elaborated by our cares
Thus, this literature review covers 24 scientific articles.

Step 4: Measure article impact
Measuring the impact of the article is an important step of SLR since it shows its scientific relevance and quality. Indeed, not all sources of knowledge have the same value. Articles repeatedly quoted tend to have higher quality and deserve more attention than those having just few quotes. In addition, the fact that some authors are more quoted than others may reveal that their ideas on the subject are more recognized by peers of a scientific community. Thus, we have realized a bibliometric analysis for each paper by extracting two performance indicators from software "Publish or Perish" (PoP), notably "Total Citations" (TC) and "Citation Per Year" (CPY).

Step 5: Define an analytical framework
Our analytical framework is based on literature review questions. Thus, each question was transformed in one or more units of analysis. The results can be presented as follows:

Table2. Research questions transformed in units of analysis

Question of literature review	Unit of analysis
What studies on HR dimension of open innovation have been conducted to date and how did the research on the subject develop over time?	Type of article
	Themes addressed
	Theories mobilised
	Approach
	Variables explored
	Empirical field
What findings have these studies procured?	Theoretical findings
	Managerial findings
What are knowledge gaps and future research perspectives?	Knowledge gap
	Research perspectives

Source : elaborated by our cares

Step 6: Establish literature review reliability
Before beginning our analysis, the reliability and validity of the data were tested. To establish reliability, it was ensured that the data collected:
•have been generated with every conceivable precaution against known pollutants, distortions and prejudices, whether intentional or accidental;
•mean the same for everyone who uses them.

Step 7: Test literature review validity
In terms of validity, our research period starts with 2003 (the concept of open innovation was introduced in this year) and finish with 2018, which is the last full year expired. Conceptual validity was also tested by studying the convergence between ranking of articles in terms of bibliometric indicators in "Publish or Perish" and in "Google Scholar". Approximately the same results were found in these two databases.

Step 8. Code data using the developed framework
During this step, the code was assigned for each unit of analytical frame, as follows:
Table3. Coding of analysis units

Unit of analysis	Code
Type of article	Type
Themes addressed	Suj
Theories mobilized	The
Approach	Appr
Variables explored	Var
Empirical field	Emp
Theoretical findings	TheFin
Managerial findings	ManFin
Knowledge gap	Gap
Research perspectives	Pers

Source : elaborated by our cares

Step 9. Develop insights and critique through analyzing the dataset
The selected articles were analyzed according to a literature review protocol based on coded units of analysis. Summary tables and visual graphs were created. The impact of articles in terms of total citations number was taken into account. In addition, papers were assembled in groups based on specific criteria.

Step 10. Develop future research paths and questions
We have analyzed and reformulated the opinions of authors presenting their points of view on future research directions at the end of each article. Moreover, a critical look on the contributions of the reviewed literature revealed us some knowledge gaps and thus some needs for future research. Having explicated our research methodology, the results of this literature review will be detailed in the following section.

3. RESULTS

We will first present the results of our statistical analyses, illustrated by some graphs. Then, the main contributions of the authors will be summarily presented. Although the lower publication date of research period was defined as 2003, the first article on the topic was published in 2009. In other words, the first initiative to connect open innovation to HRM was undertaken only 10 years ago.

The evolution of number of papers published over the last ten years shows that lately the subject becomes increasingly interesting for the scientific community, especially from 2016. (Figure 1 in Annexure) The share of articles published in scientific journals specializing in HRM is 17%. This suggests that the subject is still poorly studied in its HR perspective, and this is an opportunity for future researchers. Moreover, all the analyzed articles (Figure 2 in Annexure) note the importance of HRM for open innovation and underline the lack of studies carried out in this respect. Notably, (Chatenier et al., 2010 [6]) state that open innovation process presents a highly social complexity and advocate for research on the strategic involvement of HRM staff in open innovation teams: "In the literature on open innovation management, it is widely recognized that people play the crucial role in the process of collaborative knowledge creation. However, the literature does not seek to explore the human side of open innovation teams." (Podmetina et al., 2013 [26]) assert that the human side of open innovation (OI) has been neglected since the connection between OI initiatives and HR practices has been scarcely studied. (Burcharth et al., 2014 [3]) claim that limited attention has been paid to intra-organizational challenges and employee attitudes towards knowledge in implementing open innovation. Similarly, (Salampasis et al. 2015 [30]), (Lenz et al. 2016 [18]) and (Natalicchio et al. 2018 [21]) point out that insufficient literature has been addressed to human resource management practices in the context of open innovation. (Bogers et al., 2018 [2]) discuss the need to better understand the ability of employees to recombine internal and external knowledge for open innovation purposes. Finally, emphasizing that acquisition of external knowledge causes several internal cultural tensions, requiring the human resource management efforts, (Papa et al., 2018 [23]) recommend studying the link between knowledge acquisition, HRM and innovation performance in OI context. In regard to the subjects considered as most important for scientific community, it could be illustrated by measuring articles impact as depicted in Figure 3 in Annexure. The article with the highest number of quotations is (Chatenier et al. [6]) published in 2010; it was to be expected since it is nearly the oldest article in our selection. The second article with significant impact is (Burcharth et al. [3]) edited in 2014. However, we should emphasize the fact that the most recent articles are still not sufficiently quoted due to time. In this regard, two other articles stand out in our selection, namely (Martinez-Conesa et al., 2017 [19]) having already received 32 quotations in a little more than a year; as well as (Bogers et al., 2018 [2]) having obtained 11 quotations during just few months. Regarding to a distribution of articles by approach used, the largest share is attributed to quantitative research (58%). Qualitative studies are almost three times fewer than quantitative ones and 17% of papers are theoretical and conduct a literature review or develop a conceptual model. 4% of articles are based on the mixed approach and use both qualitative and quantitative methods. (Figure 4 in Annexure) In terms of epistemological positioning, most of the authors adopted positivism (65%), followed by post-positivism (one fifth of the articles). Interpretativism was chosen by 15% of researchers, while there is no article using constructivism in our selection. (Figure 5 in Annexure). Only nine from twenty four articles have explicitly mentioned the theories mobilized. The most used are resource-based theory, theory of absorption capacity and theory of human capital. (Figure 6 in Annexure). Regarding empirical data collection methods, a quantitative survey is the most widely used, followed with a large gap by semi-structured and structured qualitative interviews. (Figure 7 in Annexure). Concerning data analysis methods, the most applied are structural equation and simple linear regression models, followed by factor analysis. (Figure 8 in Annexure). The variables studied in quantitative articles are presented as cloud of points, the size and thickness of variable title corresponding to frequency it has been examined with. (Figure 9 in Annexure). Thus, the variables most often analyzed in quantitative articles of this SLR are openness degree and innovation performance. (Figure 10 in Annexure). Concerning HR practices, the most often studied variables are heterogeneous work teams, recruitment, training and skills development. In addition, after analyzing quantitative papers, we have identified the most examined relations between variables as presented in Figure 11 in Annexure. Thus, the impact of HR practices on openness degree (in acquiring external knowledge) was tested by four articles, while three other papers have analyzed the influence of openness on innovation performance, relation moderated by HR practices. As presented in the graph below, the majority of empirical research has been carried out in European countries (70%), mainly in Italy, Spain and Denmark. It is notable that, according to this SLR, no empirical study on the subject has been carried out in Arab or Maghreb countries. After analyzing selected articles, we have regrouped it by two criteria, namely approach used and central idea.

NB: For best synthesizing of results, two papers using mixed approach were attributed as follows:

- (Lavrynenko et al., 2018 [16]) - to qualitative articles;
- (Lazzarotti et al., 2015 [17]) - to quantitative articles.

The findings of selected papers will be summarily presented below, grouping the articles by its main idea and approach used.

- **Theoretical research articles**

Group 1:

(Du Chatenier et al., 2009 [10]) attempt to understand how individuals interact in collaborative knowledge creation within open innovation teams and what difficulties they face. The authors carried out a wide literature review, synthesized and analyzed studies, mobilized theories and concepts dealing with HRM,

organizational and learning sciences. Based on this analysis, the authors have developed the conceptual model of collaborative knowledge creation which involve different types of knowledge and demonstrate how people interact at individual and collective levels. The second authors finding consists in developing the list of challenges faced by professionals within open innovation teams.

Group 2:

Based on relational perspective of alliances, (Estrada et al., 2013 [12]) focus on HR practices alignment of multiple partners as enabler of performance. The authors enrich the existing literature by explaining how HRM alignment contributes to a strong climate for product innovation during establishment of multi-partner alliance teams. To do this, the authors re-conceptualize a traditional notion of HRM alignment extrapolating it to the case of multi-partner alliances teams and introducing its new dimension. Therefore, the researchers consider three dimensions of HRM alignment (vertical, horizontal and relational) at two levels (partner and interpartner), explaining so its dualistic nature. The research results have provided some managerial implications. Thus, according to the authors, all partners involved in multi-partner alliance team should jointly designate their HRM practices. Although it is not possible to define an alliance-specific HRM system, at least decisions regarding the composition of alliance teams should be taken commonly by all partners involved. The co-development of these practices serves to promote internal coherence within alliance teams, optimizing so individual partner efforts.

Group 3:

(Greer and Stevens, 2015 [13]) affirm: "The shortage of employees with the necessary skills for collaborative innovation with clients underlines the need for an effective HR process. In addition to staff problems, there are also HR challenges related to development, deployment, performance management, control and climate." Emphasizing the lack of research on this topic, the authors develop conceptual theoretical framework for aligning human resources practices and systems to collaborative innovation strategies with clients (CIC). Therefore, the authors conducted a literature review in several scientific fields and were able to construct a theoretical framework with inferences about how HR practices may be linked to open innovation logic. This literature review also allowed identifying the most important issues of open innovation within several HR aspects: recruitment, selection, talent development, HR systems, deployment practices, performance management practices, climate and culture. The challenges in aligning HR practices and systems with OI (and notably CIC) strategy were determined by authors as well. (Salampasis et al. 2015 [30]) emphasize: “The core of the concept of open innovation falls into the kingdoms of open organizational boundaries, and the influx and constant reflux of knowledge. The role of HRM is critical as knowledge and experience are transferred and shared between firms, as well as human resources.” Therefore, the authors develop a conceptual model exploring the link between HRM practices and open innovation adoption in banking sector, in relation to two fundamental organizational elements: trust and organizational readiness. The research results suggest that: a) HRM influences open innovation adoption in banking sector; b) trust and organizational readiness moderated this relationship.

- **Qualitative research articles**

Group 1:

(Chatenier et al., 2010 [6]) explore skills professionals need to work in open innovation teams and to face its challenges. By conducting a literature review, the authors identified a list of challenges related to open innovation projects. Then, a qualitative study resulted in elaboration of competency profile for open innovation professionals, able to generate new knowledge, build trust and cope with low reciprocal engagement. Thus, the three most frequently mentioned competencies are: 1) combine (create win-win situations); 2) demonstrate social astuteness (understand social situations); 3) socialize (develop, maintain, and use effective networks) and interpret (listens actively). The competency profile identified by authors can thus serve as a real starting point for HRM specialists in collaborative innovation teams as it could be used for selection, training, development and performance management of open innovation professionals. (Lavrynenko et al. 2018 [16]) enrich the literature on employee competencies for open innovation and provides conclusions for HRM practices. Notably, they examine biotechnology expertise composition and its relationship to open innovation process. The authors understand “soft skills” as the set of employee's traits, abilities and experiences that depend on individual and therefore are difficult to codify. Two other types of competencies that form the employee profile are “hard skills” and “digital skills”. “Hard skills” are defined in the paper as the body of knowledge, competencies and abilities acquired by individual during professional training in specific field and which are used to perform professional tasks on a regular basis. In turn, "digital skills" are determined as the set of digital requirements, as well knowledge of software inherent in the specific work field. The results of research (quantitative + qualitative) showed that the demand for soft skills has substantially increased in recent years in relation with open innovation expansion, because the concept requires certain employee's traits and competencies to manage relationships with external partners. However, the demand for these soft skills is not explicitly expressed in job advertisements of firms. As a managerial implication of research, the authors recommend to further align human resources policy with changing expectations of employee skills, in such a way that actual requirements for candidates should be explicitly expressed and sufficiently detailed in job advertisements.

Group 2:
(Petroni et al. 2012 [24]) interest in how open innovation adoption by R&D laboratory changes its organizational structures and alters the methods used in scientific staff management. Indeed, in open innovation context, new professional profiles appear in R&D laboratory such as "integration experts" or "T-men", people with scientific expertise and at the same time with a strong capacity for integration and coordination, able to select and integrate external knowledge and manage complex structures (especially matrix and network). In order to prepare these new profiles, training programs, as well as the career paths of scientific staff, need to be reviewed. The first result of research is the categorization of open innovation practices adopted by companies; the second - verification that the adoption of these practices tends to change the organizational structures of traditional R&D. These changes also lead to changes in the scientific staff management model with an emphasis on training programs and thus career paths. Thus, the study shows that the old HRM model has been abandoned as a result of the introduction of open innovation practices and the most appropriate model for staff development in OI context becomes "open dual ladder", close to German and Japanese approaches. Another finding of research is that open innovation reduces the role of senior scientists, this profile not being really suited to collaborative innovation practices which require the integration of new knowledge and skills. A greater value is given to scientists and engineers with the knowledge and personal characteristics, who enable them to play an important role in integrating different fields (T-men).

Group 3:
(Calamel et al. 2012 [4]) examine HR dimension of open innovation in particular context of cluster. A longitudinal study based on the observation of two collaborative projects in one of the largest clusters in France was conducted. Emphasizing the HRM challenges within an innovative cluster dealing with variety of working populations, employment status and professional cultures, the authors conclude that coordination efforts have not been sufficiently undertaken. Far from being acquired, cooperation is the product of progressive learning process, in which HRM becomes an additional lever that can be mobilized.

Group 4:
(Lenz et al. 2016 [18]) were interested in HRM challenges caused by interpersonal relationships created during open innovation process as well as in possible strategies to address these challenges. Research results reiterate the importance of trust in interpersonal relationships, while the central finding of the study is that among all types of OI challenges, the HR challenges are the most important. In particular, HR challenges in open innovation context are a) interpersonal relationships; b) power shifting inside the organization; c) people's sense of being valued. The authors explain the managers strategies to address these challenges and to build the best working environment: a) improving interpersonal relationships; b) find power balance; and c) make people more valuable. (Carayannis and Meissner, 2017 [5]) attempt to identify a changing nature aspects of innovation process and to better understand the company's current challenges for open innovation management.

- **Quantitative research articles**

Group 1:
(Olander and Hurmelinna-Laukkanen, 2010 [22]) explore the extent to which HRM-related mechanisms are used for knowledge sharing, and how knowledge protection mechanisms affect the level of communication between R&D alliances partners. The results suggest that the stronger HRM related mechanisms for knowledge sharing, the higher is level of communication. On the other hand, no significant relationship was found between related to HRM mechanisms for knowledge protection and level of communication. As a managerial implication, this study suggests that a coherent HRM system should be introduced in all companies engaged in collaborative R&D to strengthen the knowledge sharing within and between collaborating firms and thus create circumstances for new knowledge creation.

Group 2:
(Clausen, 2013 [8]) aims to explain the firm ability to enter in open innovation process by its absorption capacity. The research results show that investment in in-house R&D, training and highly qualified human resources (human capital), which are the main aspects of the firm's absorption capacity, have a positive impact on inbound open innovation. (Burcharth et al. 2014 [3]) focus on employee attitudes towards knowledge in open innovation practices implementation, i.e. NIH (not invented here) and NSH (not shared here) syndromes. Building on socio-psychology literature, the authors wonder whether the negative impacts of NIH and NSH syndromes on open innovation can be limited by the implementation of skills building programs based on employee training. The results of the study affirm that professional training programs and programs for innovation and creativity development are effective against NIH syndrome, while individualized forms of training (special talent incubator) are effective against NSH phenomena. At the same time, incubating special talents reinforces the negative impact of NIH syndrome. This may be due to the fact that development of leadership qualities in special talent incubation programs roots the concepts of self-engagement and empowerment (emancipation), which may lead to a tendency to underestimate knowledge from others. Inspired by resource-based, contingency and social exchange theories, (Martinez-Conesa et al., 2017 [19]) develop and test the integrative research model that analyzes the effects of organizational antecedents on knowledge management (KM) capacity and, together with external factors, their impact on open innovation. Research findings have shown that engagement-oriented HR practices have a positive

influence on KM capacity as they help to encourage and motivate employees to collaborate and share knowledge during their daily work tasks.

Group 3:

(Podmetina et al., 2013 [26]) attempt to bring together the HRM theories and open innovation for building a model addressing two main research questions:

• How do HR practices (motivation, learning, training, appreciating of human capital value) support open innovation?

• How HR practices influence the internal and external firm openness?

Research findings suggest that staff training is essential to support the company's open innovation strategy; the internal motivation system is an asset to foster internal and external openness in OI implementation process. In addition, high appreciation of the staff and its value are important to increase the level of internal and external openness. (Bogers et al. 2018) respond to the call for open innovation research at the multidimensional level by linking OI concept with human capital, absorptive capacity, learning, diversity and creativity. Thus, the article sheds light on the relationship between employee characteristics and external knowledge sourcing exploring how employee diversity affects the company's external openness. By diversity the authors understand, in particular, the diversity of the career path and those of training. The results of research confirm the direct positive relationship between diversity of employees training and firm openness. However, the direct association was not found between diversity of employees' career paths and firm's openness. The absence of this direct association may indicate that the concept at the individual level is not easily aggregated at the firm level, and that an underlying mechanism is necessary. The analysis shows that by engaging in open innovation process, companies with diversified portfolio of human capital are better off than those without, because they can harness the diversity that already exists and do not need to create this diversity with new recruitments. Thus, managerial implications relate to recruitment practices in companies engaged in OI strategies.

Group 4 :

(Lazzarotti et al., 2015 [17]) attempt to understand why some companies are able to extract added value through open innovation and others not. Thus, the article explore the mediating role of absorption capacity antecedents in the relationship between openness degree and firm's innovation capacity. The results showed that managerial/organizational and social factors, being absorbing capacity antecedents, are positively related to innovation capacity. Moreover, without the right context, the opening of the enterprise is not effective. Finally, the intensity and amplitude of absorptive capacity antecedents is consistent with openness degree. The practical contribution of the article lies in the recommendations made to managers and HR managers of companies wishing to take full advantage of open innovation. Thus, the authors advocate paying greater attention on selection and recruitment of staff with appropriate socio-psychological traits, on training and development programs promoting knowledge sharing and transfer, on encouraging incentives for collaborative behavior and on developing rewarding systems related to collective outcomes. (Ardito and Messeni Petruzzelli, 2017 [1]) examine the relationship between external research scope (variable close to openness degree) and innovation capacity, moderated by the effect of Strategic Human Resources Management practices (SHRM). SHRM practices are represented in the paper by heterogeneous working groups and brainstorming sessions. The results showed that this relationship can be graphically presented as the reverse U-curve. Thus, knowledge acquired from external sources fosters the growth of innovation capacity. But from a certain moment, when the number of external knowledge sources is too much (over-research), the effect is opposite and the negative effects exceed the benefits obtained. In addition, according to the study, the arrival of this opposite effect can be delayed by heterogeneous working groups and brainstorming sessions. On the other hand, enhancing and motivating HR practices do not seem to have similar effects at all. (Natalicchio et al., 2018 [21]) attempt to explain how open innovation strategy influences firm's innovation capacity and how this relationship is moderated by HRM practices dealing with competencies, notably recruitment of highly qualified employees and training programs implementation. The research results showed that acquisition of knowledge developed externally has a positive impact on firm's innovation capacity. Also, while the implementation of training programs impacts negatively this relationship, the moderating effect of recruiting highly qualified employees is not statistically significant. Indeed, highly qualified employees, given their capabilities and skills, are more adept at managing organizational expansion activities beyond the company's borders by recombination of internal and external knowledge. On the other hand, human individual capital itself is not sufficient to positively impact innovation capacity, since it need to be supplemented by social capital to allow networking and sharing of personal knowledge with colleagues. In regard with training programs, they can lead to a greater empowerment of employees and increase the confidence in their own skills and knowledge, making them reluctant to use outside knowledge (NIH syndrome). Taking into account that open innovation is a relatively new concept, the themes and methods of traditional training programs may be ineffective due to the lack of compatibility with the concept, to the point that they can even be harmful to the firm's innovation capacity. Thus, the implementation of training activities covering new themes and adopting creative and modern pedagogical methods, such as e-learning, gamification, digital platforms use, on the job training, can be more effective for companies involved in collaborative innovation process. Similarly, (Papa et al., 2018 [23]) have studied

the effects of external knowledge acquisition on innovation capacity and moderating role of human resources management in terms of employee retention and HR practices. The authors point out that HR practices develop a strong climate of trust and flexibility within the organization, allowing employees to feel freer to innovate and share their ideas and visions. In addition, HR practices improve employees' understanding of their company's mission, values and needs; make them more easily adhering to open innovation strategy reducing the impact of NIH syndrome. Concerning employee retention, the authors explain its moderating effect by the fact that it increases the level of confidence and employee commitment, promoting innovation culture and fostering knowledge enrichment. In addition, the research results highlight that HRM practices such as selection, recruitment, training programs, work flexibility, group work, rewarding system, are also important to promote collaborative innovation approach and stimulate external knowledge acquisition, in turn increasing innovation capacity.

Group 5 :

(Zubielqui Corral et al. 2017 [9]) examine how external knowledge flow from market actors (customers, suppliers and consultants) acquired via social media affects innovation capacity and, in turn, firm's performance; and how modern HRM practices moderate this relationship. Distinguishing from traditional HRM practices such as recruitment, training, promotion systems etc., under the term "modern HRM practices" the authors understand high level of decisions delegation and extended channels of lateral and vertical communication. Moreover, according to the authors, the relevant HRM practices for open innovation context are employee's rotation between different functions and the implementation of cross-functional work teams. These practices help to create the organizational context that promotes knowledge acquisition and sharing. The research results show that social media plays a mediating role in relationship between external knowledge acquisition and innovation capacity. Indeed, social media does not replace traditional methods of sourcing knowledge, particularly personal contact with customers and suppliers, but it can complement these traditional channels, especially in cases where it is difficult to meet customers or suppliers physically or maintain regular personal contacts. However, the mediating role of social media is valid only for companies that use modern HRM practices. For firms that place low emphasis on modern HRM practices, only external knowledge gained through traditional knowledge transfer channels helps to improve innovation capacity. Based on contingency theory, resource-based theory and its extensions (knowledge-based theory), (Popa et al. 2017 [27]) empirically assess the effects of organizational antecedents and innovation climate on open innovation, as well as their consequences on firm performance moderated by environmental factors. The research results show that HRM practices have a different impact on innovation climate. Thus, engagement-oriented HR practices such as motivation and development have a positive impact on innovation climate, and their impact is stronger than that of selection HR practices. Moreover, contrary to the authors' expectations, structural factors such as interdepartmental connectivity and centralization of decision-making do not seem to have a significant effect on innovation climate. Thus, the managerial implication of research is that in order to create an appropriate climate of innovation, firms should pay more attention to HR practices than to structural factors. (Hernandez-Espallardo et al. 2018 [14]) explore how the firm's performance is influenced by their involvement in collaborative innovation. Resource-based contextual dimensions improve innovation performance mediating by work attitudes of employees involved in inter-organizational collaboration, in particular their satisfaction at work, their appreciation of the quality of their relationship with their colleagues and their commitment to the company. Therefore, the authors demonstrate that employees play a crucial role in value creation and ownership. Complementary abilities and a collaborative innovation culture are the conditions for the creation of value nourished by the firm's employees, respectively with their knowledge-related abilities and their collaborative abilities. The authors observed that the positive attitudes of the employees involved in the collaboration towards work are the necessary conditions. Thus, employee attitudes towards work, such as job satisfaction, employee relationships with colleagues, commitment to the company, must be taken into account in the whole strategy of open innovation, if the company wishes to take advantage of external collaborations. Thus, the role of HRM in creating a competitive advantage for the company involved in open innovation has been empirically demonstrated. The results of the study support the importance of deploying collaboration-oriented and commitment-oriented HR systems to align HR practices with the open innovation strategy and collaborative innovation practices. Thus, the authors recommend that managers reinforce such employee behaviors such as information sharing, cooperation and collaboration, paying attention to social capital in the recruitment and management of personnel. Such practices such as job security, internal promotions and training will improve cohesion and trust, facilitating the necessary engagement in the process of appropriating the value required to convert value creation activities into the firm's performance.

Group 6:

(Podmetina et al., 2018 [25]) is the only methodological article in this literature review. In particular, the authors conducted exploratory research by combining the deductive identification of skill groups and the inductive development model. Thus, the authors develop the generic skills model applicable for all open innovation industries. But also they proposed and validated the measurement scale for open innovation activities and

professional skills. In summary, reading a totality of articles selected for this SLR allowed us to detect the most important challenges of open innovation and to identify their link with HRM. Thus, in regard to challenges, there are firstly NIH/NSH syndromes (Non Invented Here/Non Shared Here) that concerns employees' reluctance to open up towards external knowledge or to share their own knowledge with outside partners. Secondly, there is the defiance of external knowledge integration that raises several issues in terms of culture, trust, group dynamics, diversity management, interpersonal relationships, learning, making sense, power distribution etc. Once external knowledge has been acquired and integrated, there is a need to reworking it for creating new knowledge in a collaborative way. What type of relation links these challenges to HRM? Without being exhaustive, it is a question of HR stimuli that can be mobilized to encourage openness, knowledge sharing and promote absorption capacity. It is also an issue of what new skills in the context of open innovation the company needs, what HR support is necessary to overcome social and organizational complexity, what alignment between inter- and intra-organizational HR practices? After presenting the results of our literature review, we will note in the following section some limitations of our work and point out future research directions.

4. LIMITATIONS AND FUTURE RESEARCH PERSPECTIVES

Since all work is subject to a number of weak points, ours is no exception. For the current research, three limitations can be identified. First, the search for articles of this SLR was carried out by using solely on-line available sources. Other articles on the subject may have been published in scientific journals, but have not been referenced in electronic databases. Furthermore, we consulted only Scopus and Google Scholar, while other on-line BDD, such as Web of Science or EBSCO, may contain relevant papers on the subject, that therefore have been missed in our analysis. Second, we selected only the articles edited in English language. Indeed, articles dealing with the issue and published in Anglo-Saxon journals are prevalent. However, other papers published in French are potentially available, but we have not taken them into account. Finally, the sample of articles for this SLR was conditioned by key words combinations inserted in search engines. We obviously tried to test all possible combinations, but it is possible that other ones could provide richer results. All these criticisms represent opportunities for future researchers to continue and improve the literature review on the subject. Thereby, having a global view of studies carried out on the issue we can mention some findings. First of all, given relatively limited number of articles dealing with the issue published over the last fifteen years, as well as disparity of topics and methods addressed, the results cannot be generalized. Thus, the knowledge gap remains important and the need for further research persists. Moreover, the results obtained by authors may depend on the context in which the empirical studies were conducted. Testing the same hypotheses in other contexts, other countries, other sectors, seems to be a direction for future research. Besides, according to the articles consulted, no empirical studies have been realized neither in Moroccan nor African countries. Therefore, it seems interesting to adapt the research to the Arabic-Moroccan context given its cultural differences. As qualitative research is poorly presented in the articles found, it seems appropriate to favor it in future research in order to better understand relatively new phenomenon, especially in the Moroccan context. Furthermore, the theories most often mobilized by authors are resources-based view, the theory of absorption capacity and the theory of human capital. Along the lines of (Seeck and Diehl, 2017 [32]) who undertook a review of articles published over the past 25 years (1990–2015) on the link between HRM and innovation, it would be interesting in future research to broaden the scope of theoretical bases linking two concepts. Indeed, the authors note that it is important to integrate other concepts in future studies design, including notably AMO theoretical framework (Ability, Motivation, Opportunity). Another finding: a large number of articles analyze the subject at intra-organizational level, but scarce research has been undertaken at inter-organizational level. This may be an opportunity for future research. Most of studies were administered questionnaires to a single respondent, while submitting questionnaires to multiple respondents could enrich the results. Also, the majority of researchers have gathered opinions from managers and not from employees that could lead to misinterpretation. To interview employees directly to better understand their attitudes could be a future research direction. The number of longitudinal studies conducted by authors is very limited. More longitudinal research would be needed in order to increase results validity. The external actors dealing with firm studied by authors of our SLR are usually clients/users or partner companies (alliances). It would be interesting later to analyze the impact of knowledge acquiring from other stakeholders such as government or scientists. In the rest of this section, we will present future research perspectives mentioned by the authors of our SLR. (Chatenier et al., 2010) point out that more research is needed to be able to recommend how to use the skills profile for open innovation more effectively. Furthermore, emphasizing that the skill set the employee needs may depend on the role they play in the team, authors call for undertaking further research to determine how the competency profile is conditioned by context and employee's role within open innovation team. (Estrada et al., 2013 [12]) argue that the promising way for future research is to analyze how to operate HRM alignment within multi-partner R&D alliances. The authors also underline the possibility to explore the potential effects of other HRM alignment dimensions within multi-partner

R&D alliances, such as person-team adjustment. Moreover, it would be interesting to examine empirically the specific links between different HRM practices and innovation climate in multi-partner teams. (Podmetina et al., 2013 [26]) consider that future research linking HR practices to internal and external organizational openness should use additional explanatory, moderating and mediating variables in their conceptual models and develop more reliable scales of HR practice measurement in the open innovation context. In addition, the comparison of HR practices between various organizational structures and cultures with different attitudes towards knowledge sharing in the open innovation context could be interesting according to the authors. (Ardito and Messeni Petruzzelli, 2017 [1]) point out that in the open innovation context, other HR practices could be interesting to explore such as employee rotation, working time flexibility, skill-enhancing and motivation enhancing HR practices. (Corral de Zubielqui et al., 2017 [9]) advocate for distinguishing between knowledge acquired from customers by conventional channels and those obtained via social media comparing their effects on open innovation. They also stress the need to differentiate knowledge sourced by B to B channel from those obtained in B to C. (Lavrynenko et al., 2018 [16]) underline the real need to pursue research in open innovation skills. In turn, (Bogers et al., 2018 [2]), by examining training's and work history diversity, recommend to examine other types of employee diversity that may explain the degree of a firm openness to external knowledge sources. According to the authors, a more comprehensive focus on employee characteristics is needed to obtain a complete picture of human capital diversity consequences on a firm's openness. (Podmetina et al. 2018 [25]) affirm that future research should focus on cultural differences and introduce variables measuring cultural characteristics such as leadership style, hierarchy strength, team dynamics and relational trust, linking it to the core competencies in open innovation context. (Papa et al., 2018 [23]) consider that further researchers could address the human side of open innovation by analyzing employee involvement in knowledge management and collaborative activities. (Natalicchio et al., 2018 [21]) point out that studies on the impact of HRM practices on the effectiveness of external knowledge acquisition strategy for improving innovation performance are rare; thus, there is a need to pursue the research on the issue. The authors call for exploring in depth the themes and methods of employee training activities, to understand whether and how investments in different types of training can better align with open innovation strategies. Studying the influence of HRM practices on open innovation, they recommend analyzing in greater depth the personal characteristics of individuals. Notably, it is a question of how employees' soft skills may influence the effectiveness of HRM practices in open innovation context. The summary of our structured literature review will be presented in conclusion.

5. CONCLUSION

The concept of open innovation was introduced by Henry Chesbrough in 2003. An overview of articles dealing with state of the art on open innovation published during the past 15 years showed that human side of open innovation and its link to HRM are not sufficiently studied. Recognizing this, we undertook a literature review to find out what has been written to date on the topic, identifying knowledge gaps and thus future research directions. A selection of 24 papers from indexed scientific journals sourced from Scopus and Google Scholar databases were analyzed using structured literature review methodology. The results of analysis showed that, although the share of articles published in HRM specialized journals remains small, the interest for the subject has significantly increased in recent years. The theoretical articles explore how individuals create knowledge in open innovation teams and examine the alignment of HR practices with open innovation strategy. The themes covered by qualitative articles are competency profile changing and HR challenges caused by open innovation context. As for quantitative articles, the influence of HR practices on firm openness, as well as the impact of external knowledge acquisition on innovation capacity moderated by the effect of HR practices, are mainly studied. Papers with the greatest impact in terms of total citations number relate to employee attitude management, knowledge management and identification of competencies essential for open innovation professionals. The theories most often mobilized by authors are resources-based view, theory of absorption capacity and theory of human capital. Empirical studies have been carried out in 70% of cases in European countries, with the Arab countries not being represented at all. Quantitative approach in our selection of articles predominates, while the share of mixed research is a minority. Considering the limited number of papers dealing with the subject published over the past fifteen years and the diversity of topics, methods and approach addressed. Thus, the knowledge gap remains important and the need for further research persists, especially in Maghreb countries context. Therefore, there is an entire spectrum of possibilities available for future researchers to better understand the place of HR dimension in open innovation process and to explain the mechanisms of their interaction.

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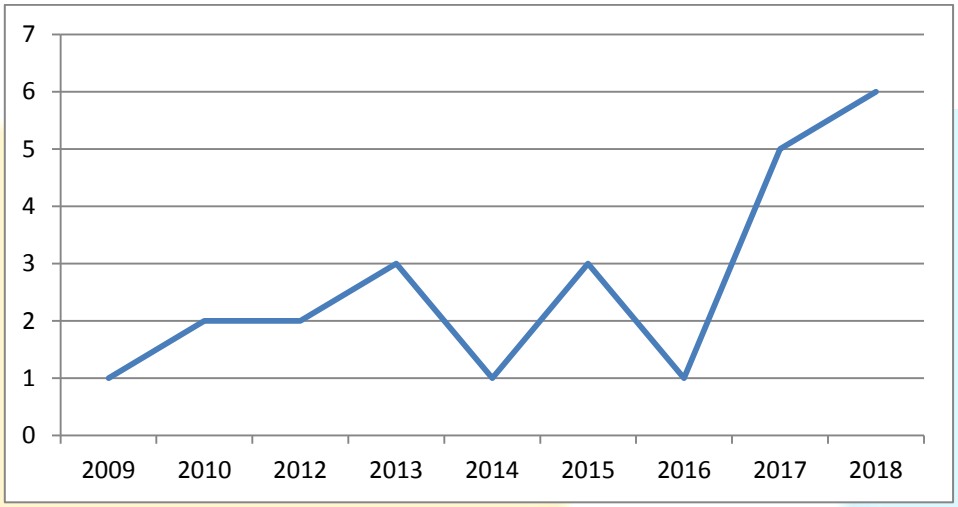
ANNEXURE

Figure1. The evolution of the number of articles published over time



Source : elaborated by our cares

Figure2. The origin of selected articles

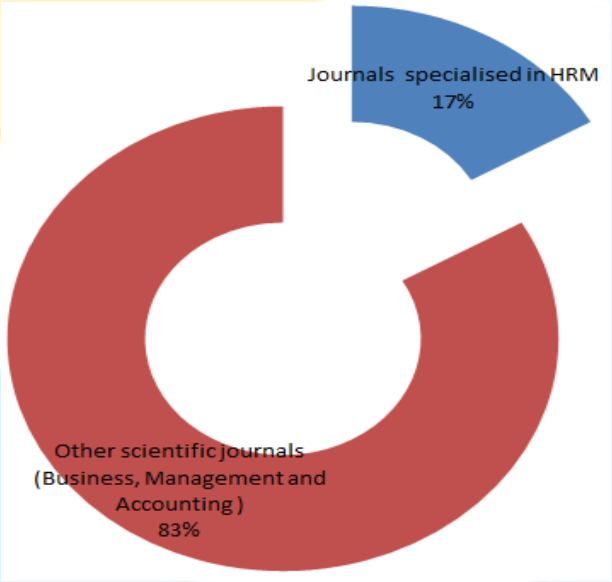


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Figure3. Impact analysis of selected papers

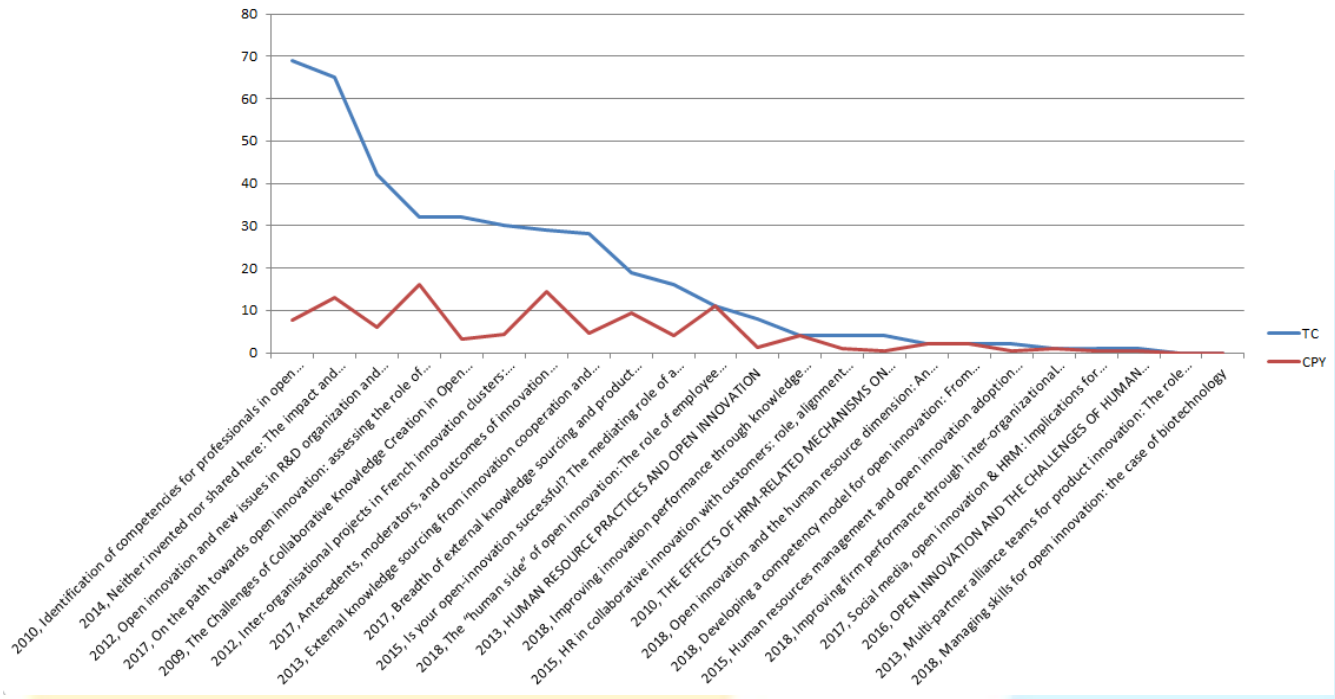

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Figure 4. Distribution of papers by approach used

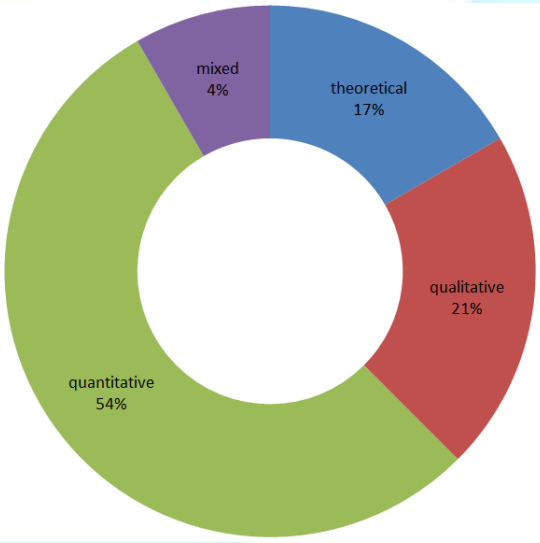

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Figure 5. Distribution of articles by epistemological positioning

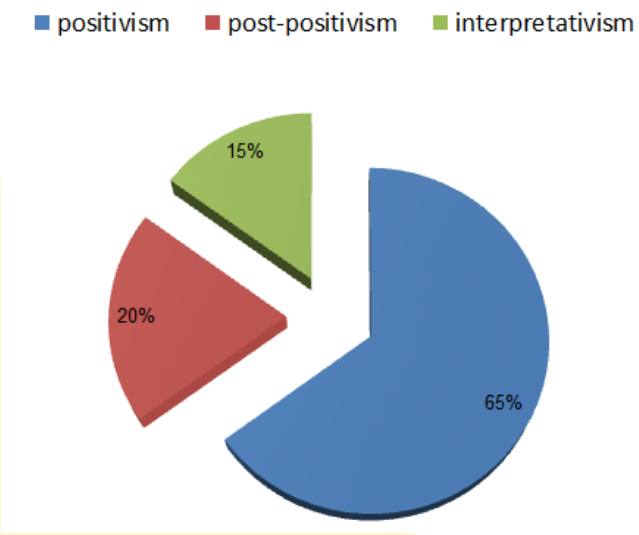

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Figure 6. Mobilized theories mentioned in articles

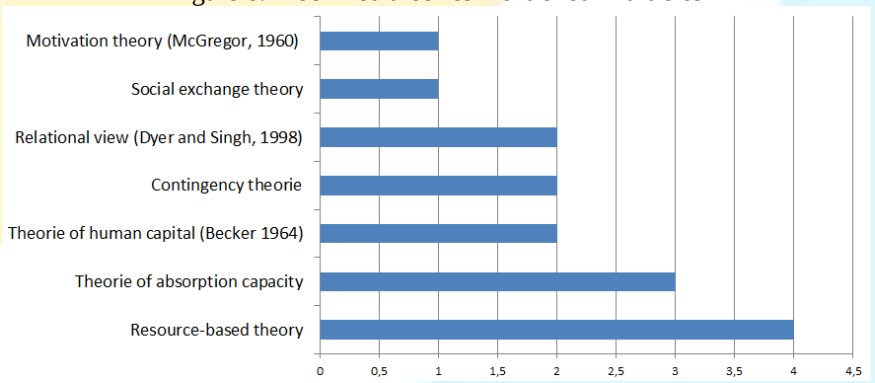

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Figure7. Methods of collecting empirical data

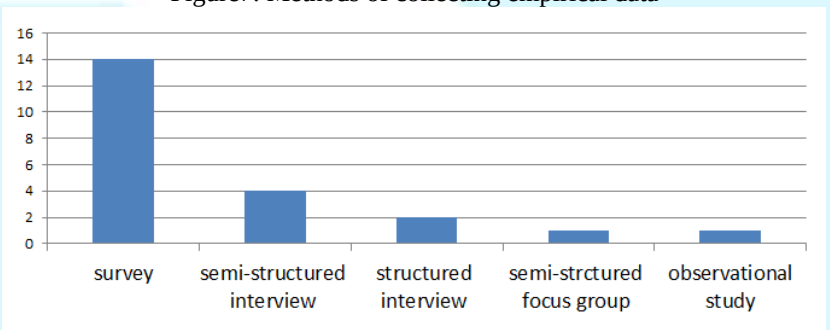

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Figure8. Methods of data analysis

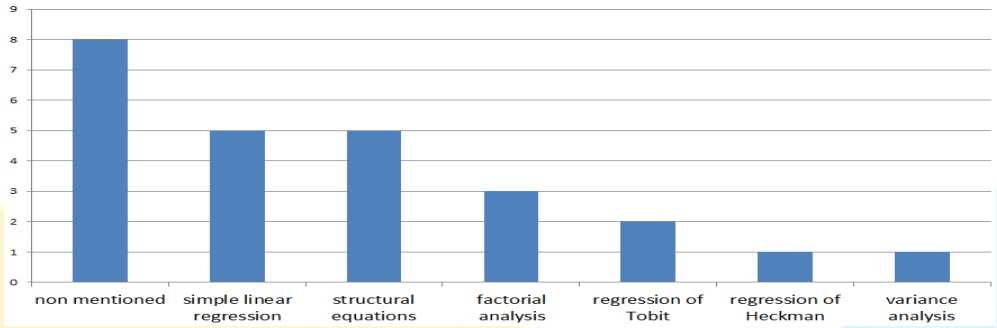

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Figure 9. Variables examined in quantitative research articles

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Figure10. HR practices explored in quantitative research articles

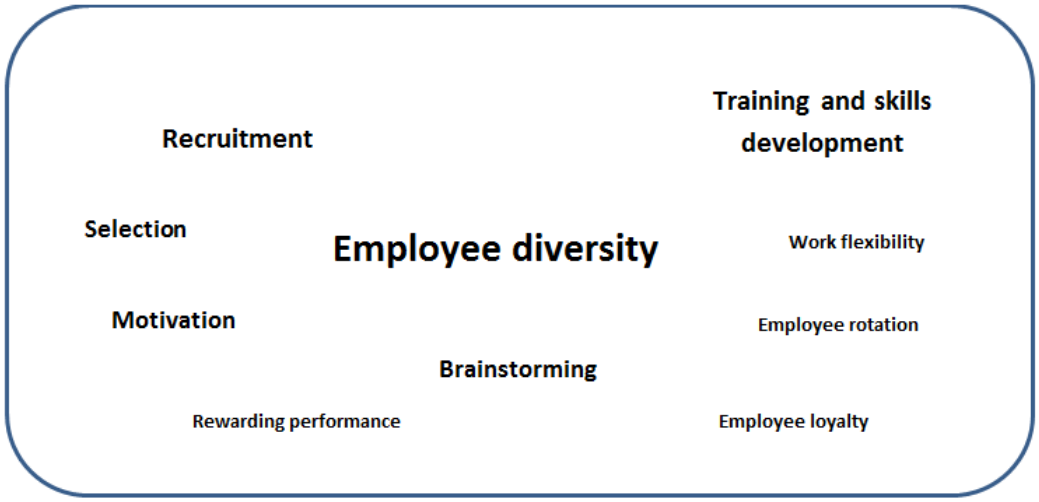

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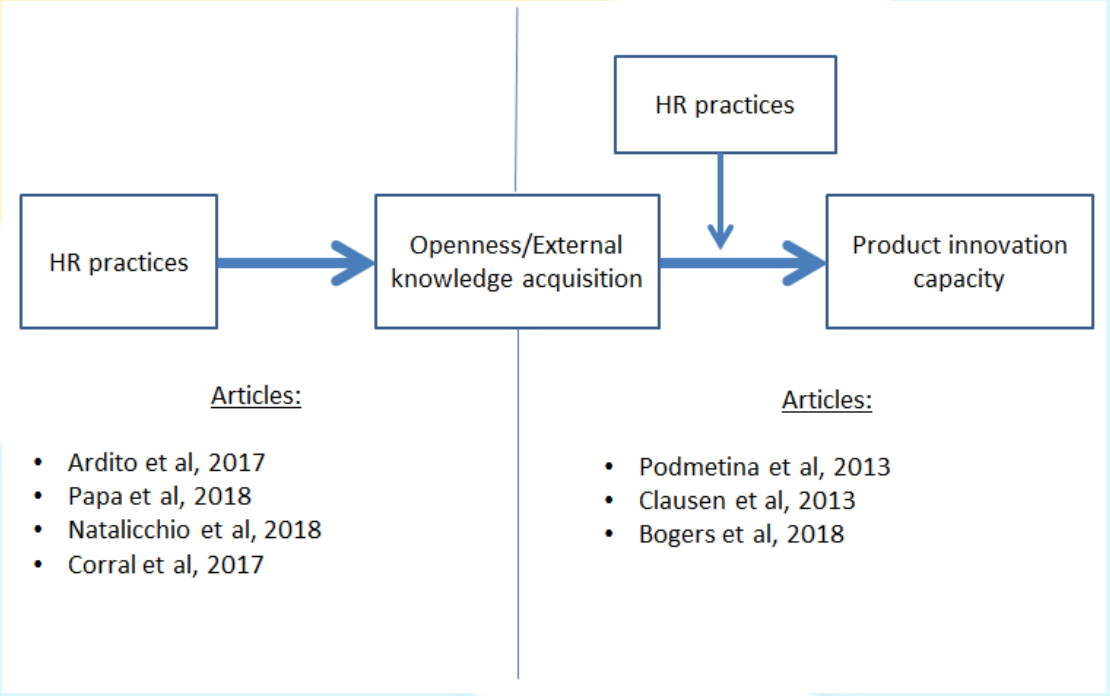
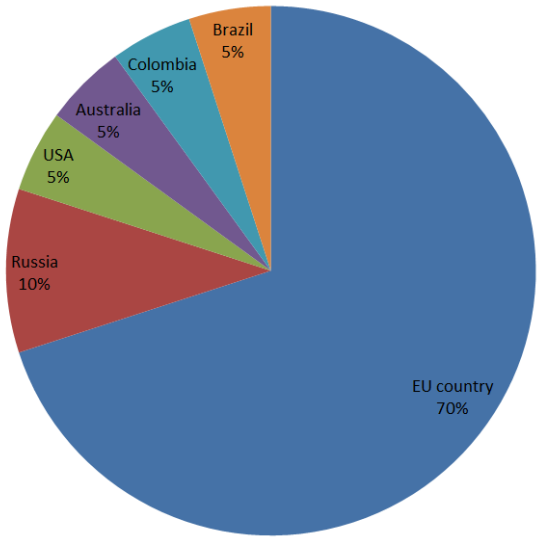
Figure 11.Les relations les plus étudiées entre les variables dans les articles quantitatifs



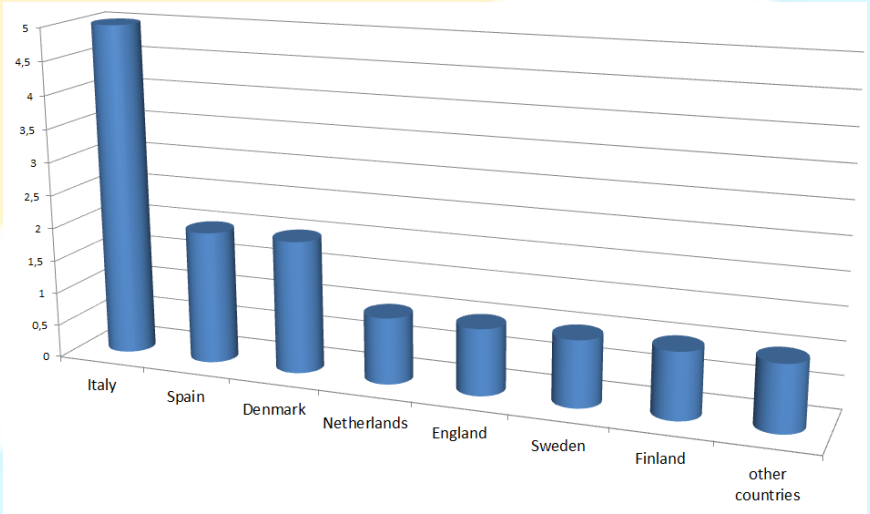
Source : elaborated by our cares

Figure12. Distribution of empirical field in the world



Source : elaborated by our cares

Figure13. Distribution of empirical field in EU countries



Source : elaborated by our cares

Table 4. Distribution of articles by themes addressed

		Main idea	Title
Theoretical research papers	1	Explore how individuals create knowledge in open innovation team and challenges they face	The Challenges of Collaborative Knowledge Creation in Open Innovation Teams (Du Chatenier et al., 2009)
	2	Examine the alignment of HR practices with open innovation approach	Multi-partner alliance teams for product innovation: The role of human resource management fit (Estrada et al., 2013)
			HR in collaborative innovation with customers: role, alignment and challenges (Greer and Stevens, 2015a)
			Human resources management and open innovation adoption in the banking sector: a conceptual model (Salampasis et al., 2015)
Empirical research articles/ Qualitative approach	1	Focus on human resources competences and new professional profiles for open innovation	Identification of competencies for professionals in open innovation teams (Chatenier et al., 2010)
			Managing skills for open innovation: the case of biotechnology (Lavrynenko et al., 2018)
			Open innovation and new issues in R&D organization and personnel management (Petroni et al., 2012)
	2	Explore HR challenges caused by open innovation	Inter-organizational projects in French innovation clusters: The construction of collaboration (Calamel et al., 2012)
			Open Innovation and the challenges of Human Resource Management (Lenz et al., 2016)
			Glocal targeted open innovation: challenges, opportunities and implications for theory, policy and practice (Carayannis and Meissner, 2017)
Empirical research articles/Quantitative approach	1	Research HR mechanisms and theirs effects on communication during R&D collaboration	The effects of HRM-related mechanisms on communication in R&D collaboration (Olander and Hurmelinna-Laukkanen, 2010)
	2	Attempt to explain the adoption by firm of open innovation strategy	External knowledge sourcing from innovation cooperation and the role of absorptive capacity: empirical evidence from Norway and Sweden (Clausen, 2013)
			Neither invented nor shared here: The impact and management of attitudes for the adoption of open innovation practices (Burcharth et al., 2014)
			On the path towards open innovation: assessing the role of knowledge management capability and environmental dynamism in SMEs (Martinez-Conesa et al., 2017)
	3	Attempt to explain the firm openness degree	Human Resource Practices and Open Innovation

			(Podmetina et al., 2013)
			The "human side" of open innovation: The role of employee diversity in firm-level openness (Bogers et al., 2018)
	4	Attempt to explain the firm innovation capacity	Is your open-innovation successful? The mediating role of a firm's organizational and social context (Lazzarotti et al., 2015)
			Breadth of external knowledge sourcing and product innovation: The moderating role of strategic human resource practices (Ardito and Messeni Petruzzelli, 2017)
			Open innovation and the human resource dimension: An investigation into the Italian manufacturing sector (Natalicchio et al., 2018)
			Improving innovation performance through knowledge acquisition: the moderating role of employee retention and human resource management practices (Papa et al., 2018)
	5	Attempt to explain the firm performance	Social media, open innovation & HRM: Implications for performance (Corral de Zubielqui et al., 2017)
			Antecedents, moderators, and outcomes of innovation climate and open innovation: An empirical study in SMEs (Popa et al., 2017)
			Improving firm performance through inter-organizational collaborative innovations: The key mediating role of the employee's job-related attitudes (Hernandez-Espallardo et al., 2018)
	6	Develop the measurement scale for professional skills and open innovation activities	Developing a competency model for open innovation: From the individual to the organizational level (Podmetina et al., 2018)

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