The Impact of Open Innovation Preparation on Organizational Performance: A Systematic Literature Review

AUGUSTINA ASIH RUMANTI1, (Member, IEEE), AFRIN FAUZYA RIZANA1, FADILLAH RAMADHAN2, AND ROCKY REYNALDO3

1Department of Industrial Engineering, Telkom University, Bandung, West Java 40257, Indonesia
2Department of Industrial Engineering, Institut Teknologi Nasional, Bandung, West Java 40124, Indonesia
3Faculty of Business and Economics, The University of Melbourne, Melbourne, VIC 3010, Australia

Corresponding author: Augustina Asih Rumanti (rumanti.augustina@gmail.com)

ABSTRACT Open innovation involves external parties of the organization in innovation activities within the organization, resulting in the flow of knowledge and information internally and externally (inbound and outbound). Given the advantages of having external support in the internal innovation process, organizations are starting to adopt the open innovation model to help them achieve and sustain innovation. The parties involved in open innovation are suppliers, consumers, competitors, and society. Such involvement will increase the organization’s ability to achieve better performance. This study aims to provide a more updated, comprehensive, and clearer picture of the importance of organizational readiness to innovate, especially through open innovation. This study also seeks to present a more comprehensive identification of the impact of open innovation on company performance by using a systematic literature study. The systematic literature review conducted in this study can serve as a basis for future research that discusses policy strategies to improve organizational performance through the implementation of open innovation. Based on a systematic literature review, 33 main articles were obtained in accordance with the research objectives including different types of open innovation manifestations and specific open innovation practices implemented by organizations.

INDEX TERMS Open innovation, organizational performance, systematic literature review.

I. INTRODUCTION

Open innovation (OI) is seen as a paradigm shift that appears in many innovative organizations where the process of creating innovation occurs not only from internal but also from accessing and integrating external knowledge [1], [2]. Effective open innovation involves quality innovation resources that come from outside the organization (inbound) as well as those generated by the organization (outbound) to accelerate internal innovation, expanding market and generate innovation external to other organizations [3], [4]. The development of the current innovation process has changed from closed innovation to open innovation [5], [6], which is an innovation originating not only from internal but also external parties regardless of the company scale [9]. The concept of open innovation is based on inter-organizational studies in which the whole stakeholders are involved [10], [11]. In open innovation, there is an element of collaboration, collective creativity, and an attainment of new knowledge and its management within an organization [12]. Open innovation can also be utilized to develop an organization and a community consisting of several organizations [12].

Open innovation practices become possible as the result of the rapid development of technology such as internet and smart devices that cause the amount of knowledge and the speed of its dissemination to increase rapidly [13], [14]. The open innovation paradigm has attracted the attention of both managers and scholars and has become increasingly popular [4]. Numerous researchers put their interest in open innovation phenomenon and simultaneously, many organizations are now adopting open innovation models to help them achieve and sustain innovation [12], [15]. There are several factors that promote the growth of this phenomenon, such as the reduction of the product life cycle, the intensification of
global competition and the high costs of research and development [15]. However, to adopt open innovation, an organization needs to open up its boundaries. It is important to enable the valuable knowledge to flow in from the outside to make opportunities of cooperative innovation processes together with external parties, as well as to flow out for commercial exploitation purpose [15]. On a practical note, to participate in open innovation practice, the parties involved should consider enabling integrated policies, information sharing, alignments of incentive and appropriate the measure of performance [15].

The effect of open innovation on organizational performance is not easily investigated although in practice and theory an open innovation approach seems to be beneficial for organizations [13], [16]. This is probably because the empirical studies have not been conducted in a rather holistic and comprehensive manner. Several studies have found that there are positive effects of open innovation on company performance while several other studies discuss the inverse U-shaped relationship or even negative effects [16], [17]. Through open innovation, organizations can reduce or even eliminate the cost of innovation altogether [1], [2]. In addition, open innovation is believed to have the ability to reduce the length of new product or process development, and increase the speed of entry into new markets [18]. By opening up its boundaries, a firm can leverage the complementary assets of its partners, maximize revenue by selling unused intellectual property (IP) assets, save time and cost to develop innovation, attract potential customers by engaging them in the production process, and set new technology standards by forming partnerships [6]. On the other hand, an increase in open innovation in organizations can pose a risk of losing innovation skills, incurring higher coordination costs, and uncertainty of profit generation [19].

Open innovation carries other consequences in the organization, including aspects of organizational performance. Therefore, the impact of open innovation towards organizational performance is still quite ambivalent and requires further investigation.

This research aims to make a more comprehensive identification of the various impacts of open innovation on company performance using a systematic literature protocol developed by Kitchenham and Charters [20]. The objective that achieved of this research is to be able to provide more clear and complete description of the readiness organization in preparing open innovation that will support organizational performance. The result of this study is expected to provide insights about the relationship between open innovation and organizational performance. This research is constructed in four parts.

In the first section, the background and the objectives of this study are provided. In section 2, the methodology used in this study is explained. In section 3, the results and discussion of the systematic literature review process carried out in this study are presented. Finally, in section 4, the conclusions of this study are presented.

Previous studies, to the best of the authors’ exploration, have not conducted an identification and investigation process on how open innovation could be essential in influencing organizational performance. The contribution from this paper is reflected through a clearer depiction and update on the importance of paying attention to the organization’s readiness in conducting an open innovation in its effort to increase its performance.

This systematic literature review contributes to the efforts to increase organizational performance through a more comprehensive understanding regarding the preparation vis-à-vis open innovation, which will lead to a better exploration in finding excellent sources for open innovation (particularly from external organization). With the complexity of such a preparation, especially for SMEs, this updated understanding would also help in facilitating an organization to implement policy strategies to optimize the organizational performance.

In this systematic literature review, data is gathered regarding type of organization, industry, organization scale, including the various practices of open innovation in each organization. With the compilation of all open innovation practices, the aim is for fellow researchers and practitioners to take context-specific practices to help more SMEs that are struggling to implement open innovation practices.

II. RESEARCH METHODOLOGY

The purpose of this study is to identify the relationship between open innovation preparation and organizational performance by methodically identifying and assessing the published primary studies used to investigate a certain research question. This research adopts a systematic literature review (SLR) protocol to gather data, i.e., previous studies, in a systematic manner; is defined as a method of identifying, assessing, and interpreting all available research on a specific research question, topic area, or phenomenon that is being studied [20]. Systematic literature review is still a popular means for researcher. It can be seen in Google scholar that the number of published articles containing systematic literature review has significantly increased year by year. SLR protocols have been used by many researchers in a variety of domains. For example, the study by Anwar et al. [21] used SLR protocol to review the knowledge sharing barriers and facilitators to global software development by using three stages SLR, i.e., planning, conducting, and reporting.

Knott et al. [22] used seven-stages SLR protocol in the health domain to explore determinants of fitness in order to drive performance among shift workers with insufficient sleep. The seven stages include formulating the problem, locating and selecting studies, collecting data, appraising critically, analyzing and presenting data, interpreting result, and information dissemination [22]. The study from Kurniawati et al. [23] used SLR protocol developed by Kitchenham to identify the relationship among knowledge management, innovation, and performance. It contains five steps i.e., identification of research, primary study selection, study quality assessment, data extraction, and data synthesis.

The research by Ali et al. [24] similarly uses the SLR protocol from Kitchenham to identify success factors in
managing the partnership in software outsourcing. Meanwhile, the research by Ali et al. [25] uses the SLR protocol to identify barriers to the formation of software outsourcing partnership. This protocol includes 6 stages, i.e., identifying a problem that needs to be reviewed, formulating research question, defining the search strategy, listing research venues and deriving a search string, outlining inclusion/exclusion and quality checklist, conduction data extraction, and synthesizing the extracted data [24], [25].

A. SYSTEMATIC LITERATURE REVIEW (SLR) PROTOCOL

Similar with the studies from [23]–[25], the literature review process in this study adopted the SLR protocol developed in the Kitchenham and Charters’ study [20]. The SLR protocol in this study consists of identifying potential studies, study selection, quality assessment, data extraction, and data analysis. The process of getting the main article can be seen in Figure 1. The study adopted relevant studies, published from 2006-2020 in several journals and proceedings.

Step 1 Identify review needs and problem formulation

The systematic literature review is usually needed to summarize the existing information of some phenomena in a comprehensive and unbiased manner [20]. In this step, the problem is formulated, and the research question is developed.

Step 2 Potential Literature Identification

This step aimed to obtain the potential literatures that were relevant to the research question. The potential literatures were obtained from electronic database. This research used two electronic databases i.e., Scopus and Web of Science. Since the two electronic databases contain thousands of articles with various topic, this study developed search strategy to both databases so they could bring out only research that are relevant to the research objective. Search strategies are produced only to get certain problems from open innovation and performance. The search was carried out by using Boolean AND with keywords “Open innovation” AND “Performance” to the title, abstract, and keywords.

Step 3 Study Selection

In this step, the literature originating from the previous step is reviewed according to specific criteria. There are four criteria used in this step. First, all articles must be written in English and the full text is available. Second, all articles must provide model that present direct relationship between open innovation and performance. Third, the unit of analysis is an organization. Fourth, there is empirical data that supports the relationship between open innovation and performance.

Step 4 Quality Assessment

In the fourth step, articles that pass in step 3 will be reviewed further to check their quality. In this step, it is possible to provide more inclusion and exclusion criteria, check whether the articles conduct the systematic step, analyze and compare the result of each article, etc.

Step 5 Data Extraction

The fifth step relates to the selection of primary studies. This step is aimed to accurately record the information obtained from the primary studies. In this step, researcher will establish the data extraction form. Data extraction step is useful to identify the multiple publication that use the same data and identify the quality of the data used in the study. There are several data to be extracted in this research that was adapted from the study of Ali et al. [24] with several adjustments regarding this research context. The Data Extraction form is presented in Table 1.

### TABLE 1. Data extraction form.

| Data Extracted                  | Description                                                                 |
|--------------------------------|-----------------------------------------------------------------------------|
| Author(s)                      | Author(s) of the selected articles                                         |
| Title                          | The title of the selected articles                                         |
| Year                           | Year the selected studies published                                        |
| Publication Category           | The publication type of selected studies.                                  |
| Example: journal/proceeding    | The name of journal/proceeding the selected studies published.             |
| Object                         | The object of the study. For example, SMEs, government institution, Manufacturing firm, etc. |
| Data gathering method          | The tools used to gather the data. For example, questionnaire, interview, observation, etc. |
| Size of sample                 | The quantity of data collected                                              |
| Company size                   | The size of organization that is used as the object in the selected studies. |
| Manifest of Open Innovation    | The type of open innovation practice discussed in the selected studies.    |
| Manifest of Performance        | The type of organization performance that is discussed in the selected studies |
| Proven relationship            | The significant relationship of Open Innovation manifest and Performance manifest |

FIGURE 1. Systematic literature review protocol.
Step 6 Data Analysis and Synthesis

Finally, in step 6, all the articles that are selected from the previous step are analyzed and synthesize to obtain the findings and answer the research question. In this step, researcher will summarize the results of the included primary studies.

III. RESULTS AND DISCUSSION

This section presents the result of SLR and the analysis of SLR result to achieve the research objective. This section is presented in several sub-sections including SLR result, degree of open innovation, type of organization, type of open innovation, and open innovation and performance.

A. SLR RESULT

There were in total 287 articles obtained in the first step where 165 articles were obtained from Scopus and 122 other articles were obtained from the Web of Science. From those articles obtained from both databases, there are 60 duplicate articles. In the second step, out of 165 articles from Scopus, 120 articles were excluded because they did not fit the criteria used in this study. Meanwhile, 108 articles from the Web of Science were also issued for the same reason. Next, the remaining 59 articles would be examined and extracted. This process would produce the 33 final articles that are used as primary articles for further discussion. Table 2 and Figure 2 present a list of publishers of the research used as a reference. As can be seen in Figure 2, articles used in this study mostly come from the journals listed in Table 2.

TABLE 2. Publisher of the journal references.

| Publisher                  | Journal                                      | Reference No. | Indexing |
|----------------------------|----------------------------------------------|---------------|----------|
| Emerald                    | Management Decision                          | [2]           | Scopus   |
| Wiley InterScience         | Strategic Management                         | [3]           | Scopus   |
| Elsevier                   | Research Policy                              | [4]           | Scopus   |
| Elsevier                   | Research Policy                              | [5]           | Scopus   |
| Taylor and Francis         | Technology Analysis & Strategic Management    | [6]           | Scopus and WoS |
| Emerald                    | European Journal of Innovation Management    | [7]           | Scopus   |
| Elsevier                   | ScienceDirect Procedia                       | [8]           | Scopus   |
| Elsevier                   | Technovation                                 | [9]           | Scopus and WoS |
| Elsevier                   | ScienceDirect Procedia-Social and Behavioral Sciences | [10]          | Scopus   |
| Elsevier                   | ScienceDirect Procedia-Social and Behavioral Sciences | [11]          | Scopus   |
| Elsevier SSRN              | Journal of Innovation Management              | [12]          | Scopus   |
| SAGE Publications          | Science, Technology & Society                | [13]          | WoS      |
| Emerald                    | Measuring Business Excellence                | [14]          | WoS      |
| Emerald                    | Management Decision                          | [15]          | Scopus   |
| Emerald                    | European Journal of Innovation Management    | [16]          | Scopus   |
| Blackwell Publishing       | R&D Management                               | [17]          | Scopus   |
| Inderscience Enterprises   | Int. J. Technology Management               | [18]          | Scopus   |
| Elsevier                   | Technovation                                 | [19]          | Scopus and WoS |
| Wiley-Blackwell Publishing Ltd | Journal of Small Business Management        | [20]          | Scopus   |
| Inderscience Enterprises   | Int. J. Technology Management               | [21]          | Scopus   |
| Inderscience Enterprises   | Int. J. Technology Management               | [22]          | Scopus   |
| Emerald                    | The TQM                                      | [23]          | Scopus   |
| Emerald                    | European Journal of Innovation Management    | [24]          | Scopus   |
| Emerald                    | European Journal of Innovation Management    | [25]          | Scopus   |
| Elsevier                   | Technological Forecasting & Social Change    | [26]          | Scopus and WoS |
| Inderscience Enterprises   | Int. J. Technology Management               | [27]          | Scopus   |
| Wiley-Blackwell Publishing Ltd | R&D Management                              | [28]          | WoS      |
| IEEF                       | IEEE Transactions on Engineering Management  | [29]          | Scopus and WoS |
| Taylor & Francis Group     | Emerging Markets Finance & Trade             | [30]          | Scopus and WoS |
| MDPI                       | Journal of Open Innovation: Technology, Market, and Complexity | [31] | Scopus and WoS |
| Growing Science            | Management Science Letters                   | [32]          | WoS      |
| World Scientific Publishing| International Journal of Innovation Management | [33] | Scopus and WoS |
| MDPI                       | Sustainability                               | [34]          | Scopus and WoS |
| MDPI                       | Sustainability                               | [35]          | Scopus and WoS |
| MDPI                       | Journal of Open Innovation: Technology, Market, and Complexity | [36] | Scopus and WoS |
| Emerald                    | Journal of Business & Industrial Marketing   | [37]          | Scopus   |
| Emerald                    | International Journal of Innovation Management | [38]         | Scopus   |
| IEEE                       | IEEE Transactions on Engineering Management  | [39]          | Scopus and WoS |
| IEEE                       | IEEE Transactions on Engineering Management  | [40]          | Scopus and WoS |
International Journal Technology Management and European Journal of Innovation Management. Moreover, the articles obtained are mostly come from the management domain journal. Also, in Figure 3 we can see the year of the selected article published. The articles that match with the aforementioned criteria that also described at study selection step are mostly published in 2015 and 2021. Furthermore, between 2006 and 2021, the topic about open innovation and organizational performance still gained interest from researchers. Finally, from the last step, 33 articles were selected as the main articles to be analyzed in this study. The summary of the SLR result is presented in Figure 4. Meanwhile, the summary of the 33 articles can be seen in Table 3.

From the 33 articles obtained through the SLR, 11 articles use Small and Medium Enterprises (SME) as the research object, while 22 articles use other organizations. The summary of the object of the articles is presented in Figure 5. Furthermore, there are various types of industry that become the object of the selected article i.e. manufacturing industry, information technology, finance, food and beverage, telecommunication, and traditional handcraft. It means that open
| No. Ref | Object/Data Set                  | Manifest of Open Innovation Adoption | Manifest of Performance | Approach or Method          | Tools                                            | Result/Proven Relationship                                                                                                                                 |
|-------|----------------------------------|-------------------------------------|-------------------------|-----------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [13]  | 306 Korean SMEs                  | **Open Innovation Practice**        | Firm Performance in general | Structural Equation Modeling | Statistics Analysis Testing                      | • Joint R&D - Firm performance  
• User Involvement - Firm performance  
• Open sourcing - Firm performance |
| [14]  | 400 Korean IT SMEs               | **Open Innovation adoption**        | Revenue ratio of new product  
New Business Model | OLS Regression         | Statistics Analysis Testing | • As the open innovation efforts increase, the revenue ratio of the new products in the firm also increases.  
• As the open innovation efforts increase, more new business models are added to the firms |
| [15]  | 107 Italian Manufacturing SMEs   | Open innovation                     | Firm Performance          | Structural Equation Modeling | SPSS Statistics 17 and AMOS 18                  | • To improve performance, SMEs must rely both on internal competencies exploitation and on Open |
| [26]  | 120 biopharmaceutical companies  | **Inbound Practice**                | Innovation Performance  
Economic Financial Performance | Negative binomial regression  
OLS Regression | Statistics Analysis Testing | • Inbound OI - Innovation and Economic Performance  
• In Licensing - Economic Performance (+)  
• In Licensing - Innovation Performance (+)  
• Institutional Collaboration - Economic performance (+)  
• Institutional Collaboration - Innovation performance (+)  
• Platform biotech - Economic Performance (+)  
• Platform biotech - Innovation Performance (+)  
• Purchasing of scientific service - Innovation Performance (+)  
• Venture Capital - Innovation Performance (+)  
• Outbound OI - Innovation and Economic Performance  
• Spinoff - Innovation Performance (+)  
• External technology commercialization - Innovation Performance (+)  
• Out Licensing - Economic performance (+)  
• Divest - Economic Performance (+)  
• Coupled OI - Innovation and Economic Performance  
• Strategic Alliance - Innovation Performance (+)  
• Strategic Alliance - Economic Performance (+)  
• Strategic Alliance - Economic Performance (+) |

TABLE 3. Summary of articles selected.
### TABLE 3. (Continued.) Summary of articles selected.

| Reference | Sample Size | Study Design | Methodology | Findings |
|-----------|-------------|--------------|-------------|----------|
| [27]      | 176 High-Tech Manufacturer | Open Innovation | Firm Financial Performance + CFA | External Technology Acquisition (Inbound) is positive and significant related to firm performance. External Technology Exploitation (Outbound) is positive but insignificant to firm performance. |
| [28]      | 252 Technology-based SMEs | Inbound Open Innovation | Incremental Innovation Performance + Conventional hierarchical regression analysis | Technology Scouting - Incremental Innovation Performance |
| [29]      | 3688 Firms (Manufacturing, Telecommunications, Computer services, and Technical business services sectors) in Austria, Belgium, Denmark, Norway | Open innovation practice Breadth and Depth | Innovation Performance + Probit regression | Open innovation practice - Innovation performance |
| [30]      | 91 Chinese firms in high-tech industries | Open Innovation | Innovative Performance + Negative binomial method | Foreign technology in-licensing - Innovative Performance (strategic alliance with foreign partner, collaboration with domestic universities and research institutes, collaboration with the local industrial community) |
| [31]      | 182 SMEs Traditional Batik in Indonesia | Open Innovation | Firm Performance by Cleaner Production + Survey | Inbound OI - Cleaner Production (Outbound OI - Cleaner Production) |
| [32]      | 41 R&D Manager in Multinational Company | Open Innovation Outside - In or Inbound OI | Innovation Performance + Ordered Probit OLS | Open innovation practice - Innovation performance |
| [33]      | Telecommunication industry | Open Innovation Inbound OI | Innovation Performance + Case study | Inbound open innovation practice - Innovation performance (structured interview). |
| [34]      | 429 SMEs in Spain | Open Innovation | Innovation Performance + Maximum Likelihood factor analyses + confirmatory factor analysis (CFA) | Open innovation practice - Innovation performance |
| Reference | Sample Size | Open Innovation Practices | Firm Performance | Methodology | Statistical Test | Open Innovation Focus |
|-----------|-------------|----------------------------|------------------|-------------|-----------------|----------------------|
| [35]      | 122 SMEs    | Inbound OI, Outbound OI    | Innovation, Financial Performance | Hierarchical regression | Statistics Analysis Testing | - Open Innovation practice - Innovation performance |
| [37]      | 93 Companies in Taiwan and 120 Companies in Japan | Inbound OI, Outbound OI | Organizational Performance | PLS analysis | Statistics Analysis Testing | - Inbound OI - Organizational Performance |
| [38]      | 161 SME in Taiwan | Outside-in, Inside-out, Coupled | Innovation, Financial Performance | Hierarchical regression | Statistics Analysis Testing | - Outside in - Innovation Performance |
| [39]      | 112 firm in France | Inbound/Outside-In OI, In-sourcing, Joint R&D, Merger & Acquisition | Firm Performance | Survey, Statistical Method with ANOVA | Statistical Test with AMOS 22 | - Innovation, R&D and Technology - Firm performance |
| [40]      | 221 companies in Korea | Inbound OI, In-sourcing, Joint R&D, External Technology Acquisition | Firm Performance | Survey, Confirmatory Factor Analysis (CFA), Structural Equation Method (SEM) | Statistical Test with SPSS Version 18, AMOS Version 18 | - Product-service System - Firm Performance |
| [41]      | 3564 small and medium enterprises (SMEs) in Vietnam | Proactive Technological Innovation, Reactive innovations | Firm Performance | Survey, Multiple Regression, Ordinary Least Squares (OLS) | Statistical Test with SPSS | - Technological Innovation - Firm Performance |
| [42]      | 115 SMEs owner / managers in Malang City, Indonesia | Inbound OI, Outbound OI | Firm Performance | Survey, PLS-SEM | Statistics Analysis Testing | - Inbound Open Innovation - Firm Performance |
| [43]      | 23,642 firms in Asia, Europe and North America | Inbound OI, Product Innovation, Process Innovation | Firm Performance | Meta Data Analysis | Statistics Analysis Testing | - Inbound Open Innovation - Firm Performance |
| [44]      | 858 SMEs in Korea (733 SMEs in the manufacturing sector and 125 SMEs in the service sector) | Inbound OI, Outsourcing, Joint R&D, Manufacturing process Collaboration, Outbound OI, Patent, Certification | Financial Firm Performance | Multiple Regression | Statistical Analysis Testing | - Outsourcing - Financial Firm Performance |
| [45]      | 71 biopharmaceutical firms in US | Inbound OI (Technological innovation) | Financial Performance | Survey, Generalized Structural Equation Model (GSEM) | Statistical Analysis Testing | - Technological Innovation - Financial Performance |
| [46]      | 908 firms in Spain and Portugal | Inbound OI, Outbound OI | Firm Performance | Survey, Multinomial Regression and Econometric Analysis | Statistical Analysis Testing | - Open Innovation - Firm Financial Performance |
innovation has been implemented in various types of industries. The percentage of the type of industry is presented in Figure 6. According to the SLR, it can be concluded that most researchers choose manufacturing industry as the object for open innovation implementation.

**B. DEGREE OF OPEN INNOVATION ADOPTION**

According to the reviewed articles, the firm performance is influenced by the degree of open innovation adoption which can be associated with the terms “breadth” and “depth” [13], [17]. The term breadth can be measured by the number of OI modes that is implemented in organization.

The greater number of OI modes that are used in the organization the broader OI practiced in the organization. The term depth reflects the intensity of OI mode being practiced in an organization [13]. Intensity refers to the organization’s readiness in implementing open innovation, either that occurs in the internal organization or involves

### Table 3. (Continued.) Summary of articles selected.

| Article | Type of firm | OI Action | Firm Performance | Methodology | Analysis Tool | Firm Performance | OI Performance |
|---------|--------------|-----------|------------------|-------------|--------------|-----------------|----------------|
| [47]    | 580 firms di Malaysia | Open Innovation Action: Inbound OI - In Licensing - Venture Capital - Outbound OI - Open sourcing | Firm Performance | Survey, PLS-SEM | Statistical Analysis Testing | Inbound Open Innovation – Firm Performance |
| [48]    | 73 companies in Asia | Open Innovation Action: Inbound OI - Outbound OI | Firm Performance | Survey, Multiple Regression | Statistics Analysis Testing | Open Innovation – Firm Performance |
| [49]    | 238 Chinese high-tech firms | Open Innovation Action: Inbound OI - Outbound OI | Firm Performance | Survey, Interview, SEM | Statistics Analysis Testing | Open Innovation – Firm Performance |
| [50]    | 122 Japanese manufacturing firms | Open Innovation Action: Inbound OI (Market and Technological innovation) | Firm Performance | Survey, PLS SEM | Statistics Analysis Testing | Open Innovation – Firm Innovation Performance |
| [51]    | 242 Spanish innovating companies | Open Innovation Action: Advanced open innovators - Intermediate open innovators - Incipient open innovators | Firm Performance | Survey, SEM | Statistics Analysis Testing | Advanced Open Innovation – Financial Performance |
| [52]    | 102 Japanese larger firms in the manufacturing industry | Open Innovation Action: Inbound OI - Information External Parties - External Technology Acquisition | Firm Performance: New Product Innovativeness | Survey, Confirmatory Factor Analysis (CFA) - Structured Equation Method (SEM) | Statistics Analysis Testing | Inbound Open Innovation – New Product Innovativeness |
| [53]    | 68 worldwide top R&D pharmaceutical companies | Open Innovation Action: Inbound OI - Outbound OI | Firm Performance: New Product Success | Survey, ANOVA | Statistics Analysis Testing | Inbound Open Innovation – R&D Performance |
| [54]    | 171 Chinese firm | Open Innovation Practice: Inbound OI: External technologies - Strategic alliance with foreign partner | Firm Performance: Technological performance | Survey, ANOVA SEM | Statistics Analysis Testing | Inbound Open Innovation – Technological Performance |
external parties. The readiness of the organization can include several things, i.e., human resources, organizational systems, organizational policies, and management strategies implemented by the organization.

C. TYPE OF ORGANIZATION
The literature, which is the object of study in this research, explains how open innovation is applied to organizations both large, and small and medium scales. The character of open innovation is different for each organization depending on the scale of the company [31], [35]. Table 3 presents the information on implementation open innovation in large scale organizations or companies. In Table 4, information on the implementation of open innovation in small and medium-enterprises is presented. The implementation of open innovation in an organization both for large-scale companies or SMEs requires the involvement of various parties or stakeholders to consider various aspects. For example: integrated policies for all parties involved in the implementation of open innovation, availability of information internally, access of information (from and out of the organization), performance measurement and adjustment of compensation or additional incentives [29].

1) LARGE-SCALE COMPANIES
Several references analyzed in this study explain that open innovation is one of the policies carried out to improve firm performance and reflects the ability to compete against its competitors. Open innovation carried out by large-scale companies may facilitate these companies to improve their ability to use the latest technology in their production processes. Along with the increased ability to use the technology, the organization or company will improve the firm performance. The following in Table 4 presents data regarding the application of open innovation in large-scale companies. Based on the exploration and the data in Table 4, it can be explained that the implementation of open innovation in large-scale companies is generally supported by adequate financial capabilities and with better human resource competencies [15]. Through the R&D division, the company may conduct some research and technology development for innovation, either internally or through collaboration mechanisms with external parties. Relationships and networking with external parties are supporting factors in implementing open innovation [29], [32], [37].

2) SMALL AND MEDIUM ENTERPRISES
In this study, there are seven references that explain the implementation of open innovation in small and medium enterprises (SMEs). SMEs can implement inbound OI, outbound OI and Coupled OI. The difference in the application or implementation process depends on the type of business. SMEs that implement inbound OI, outbound OI and coupled OI are predominantly businesses that produce services and involve financial aspects in measuring company performance. Meanwhile, SMEs that implement inbound OI and outbound OI are predominantly businesses that produce products. Table 4 presents data regarding the application of open innovation on SMEs.

Based on the literature review in this study and data presented in Table 5, it can be explained that the implementation of open innovation in SMEs has its own challenges. SMEs need the involvement of stakeholders and other external parties in implementing open innovation, for example: funding assistance from the government, NGOs, training from educational institutions, among others.

D. TYPE OF OPEN INNOVATION
According to the systematic literature review, there are several manifestations of open innovation that are used to measure the level of open innovation in organizations based on the 15 main articles. Table 6 presents a summary of the open innovation variable information obtained in this study.
Based on Table 6 until Table 8, it can be seen that Inbound Open Innovation, Coupled Open Innovation, and Outbound Open Innovation are ubiquitously mentioned by researchers as manifestations or dimensions of open innovation. The three dimensions of open innovation can be implemented in every organization, either large-scale companies or SMEs. However, in general, coupled open innovation is more likely to be applied in large-scale companies as will be explained below.

1) INBOUND OPEN INNOVATION

Inbound open innovation is defined as the innovation activities concerning how to obtain knowledge from external sources (e.g. suppliers, customers, competitors, and universities) for internal use to support internal innovation resource [13], [17]. Several aspects that are included are presented in Table 6.

There are differences in the implementation or activities of Inbound OI in those carried out at large-scale companies and SMEs. In large-scale companies, OI inbound can be in the form of cooperation through the R&D division, research collaboration between institutions, technology transfer, license purchases, patent purchases, copyright purchases, and involving the role of consultants [26], [31], [33]. OI inbound activities at SMEs can be carried out through government participation or assistance through regulations, voice of customers, NGO assistance, independent research institutes, CSR activities from larger companies, and assistance from suppliers [31], [34], [35].

The implementation of inbound open innovation in an organization either at large-scale companies or SMEs is influenced by the character of the organization, organizational culture, geographical/location/country and the type of business or product produced by the organization. Therefore, this research provides an overview in mapping the implementation of inbound open innovation in an organization [31].

The various practices listed in Table 6 by no means serve as an absolute manifestation of inbound OI – in other words, this is a non-exhaustive list that allows for further addition as new circumstances are explored. Despite the association of certain inbound OI practices with whether the entity is an established firm or an SME, the authors believe that these practices are not mutually exclusive. For instance, NGOs involvement is not exclusive to SME as large companies can also engage NGOs in their approach of OI.

2) OUTBOUND OPEN INNOVATION

Outbound open innovation is a process that aims to exploit internal knowledge in a variety of ways both in current market and in innovative new market [13]. Moreover, in a simple way, outbound open innovation can be defined as the external use of internal knowledge [17]. The example of outbound open innovation is presented in Table 7.

In large-scale companies, the outbound OI can be in the form of license, investment, new knowledge, new technology, and commercial products [26]. Outbound OI activities on SMEs can be through open sourcing, collaborative research [13], [31], [34], [35]. Outbound open innovation can be done by an organization if it has been able to implement inbound open innovation [31], [34]. Outbound open innovation generates and contributes to the birth of innovation for external organizations through several platforms, through licenses, copyrights, new technology and so on.

3) COUPLED OPEN INNOVATION

Coupled open innovation is a process where knowledge can flow both inwardly and outwardly through the active collaboration with partners in order to innovate [13] and [17]. Coupled OI requires greater resources, therefore in general can only be applied by large-scale companies. The application of coupled OI in large-scale companies occurs through the active involvement between companies in producing an innovation that is used simultaneously [24]. Aspects involved in coupled OI include co-patents, strategic alliances and joint ventures [26] – as presented in Table 8.

E. ORGANIZATIONAL PERFORMANCE

Every organization or company will try to achieve optimal performance in order to win the competition with its com-

---

### TABLE 5. Open innovation in small and medium enterprises.

| Open Innovation | Reference |
|-----------------|-----------|
| Inbound OI      | [43], [47]|
| Inbound OI and Outbound OI | [13], [14], [30], [33], [35], [37], [45]|
| Inbound OI, Outbound OI and Coupled OI | [40]|

### TABLE 6. Inbound OI.

| Inbound OI Practice | Reference |
|---------------------|-----------|
| In-sourcing         | [13], [26], [28], [39], [40], [41], [44], [51]|
| Joint R&D           | [13], [26], [39], [40], [44], [46], [48], [49], [53]|
| Merger & Acquisition alliance | [13], [26], [39]|
| User involvement    | [13], [26]|
| Institutional Collaboration | [26], [30], [44]|
| Community collaboration | [30]|
| Purchasing of scientific service | [26]|
| Venture Capital     | [26], [47]|
| Platform Biotech    | [26]|
| Regulation/Government | [31], [33], [34]|
| Voice of Customer   | [31], [33]|
| Involve NGOs        | [31], [33]|
| Research Independent | [31], [33]|
| Supplier’s Advices  | [31], [33]|
| Research Collaboration | [33], [35]|
| External Technology Acquisition | [40], [45], [52], [54]|
| Proactive Technological Innovation | [41], [43], [50]|
| Information External Parties | [52]|
| Stakeholder integration | [32]|
| In licensing        | [28], [32]|
| Technology sourcing | [28], [32]|
| Technology Scouting | [28]|

---
TABLE 7. Outbound OI.

| Outbound OI Practice               | Reference |
|-----------------------------------|-----------|
| Out licensing                     | [13], [26], [32], [47], [53] |
| Spin-off                          | [13], [26], [32], [48], [51] |
| Open sourcing                     | [13], [26], [46], [49] |
| Divest                            | [26], [32] |
| Supply of scientific service      | [26] |
| External technology commercialization | [26], [42] |
| Research Collaboration            | [31], [35] |
| Patent and Certification          | [44] |
| Strategic alliance with foreign partner | [30], [54] |

TABLE 8. Coupled OI.

| Coupled OI Practice      | Reference |
|--------------------------|-----------|
| Co-patent                | [26], [28] |
| Strategic alliance       | [26], [32] |
| Strategic Joint Venture  | [26] |
| Network usage            | [32] |
| Participation in other firms | [32] |

TABLE 9. Open innovation manifest.

| Open Innovation Manifest | Reference |
|--------------------------|-----------|
| Inbound Open Innovation  | [13], [17], [24], [27], [33], [34], [37], [38], [39], [40], [41], [42], [44], [63], [46], [47], [48], [49], [50], [52], [53], [54] |
| Coupled Open Innovation  | [37], [38], [39], [43] |
| Outbound Open Innovation | [26], [27], [37], [38], [44], [33], [31], [34], [42], [44], [46], [47], [48], [49], [52] |
| Open Innovation Practice  | [26], [29], [48] |
| Open Innovation Process   | [31], [50], [53], [38] |
| Open Innovation Proclivity | [35] |
| Open Innovation Adoption  | [34] |
| Open Innovation           | [30], [31], [34], [36] |

TABLE 10. Open innovation and performance.

| Type of Performance      | Reference |
|--------------------------|-----------|
| Firm Performance         | [14], [15], [27], [31], [32], [34], [37], [39], [40], [41], [42], [43], [46], [47], [48], [49], [50], [51], [52], [53], [54] |
| Radical Innovation       | [26], [28], [35], [36] |
| Incremental Innovation   | [26], [28], [35], [36] |
| Performance              | [14], [17], [26], [28], [29], [30], [31], [33], [35], [38] |
| Innovation Performance   | [26], [38], [44], [45] |

petitors [31], [34]. Performance measurement is carried out in various ways or methods in line with the goals of the organization [34]. The performance of an organization or company can be determined by the magnitude of its ability to carry out an innovation, both innovation in the field of production or service [13], [15].

F. OPEN INNOVATION AND ORGANIZATIONAL PERFORMANCE

Through open innovation, companies can innovate by interacting with external parties [6]. Table 9 presents a list of previous studies that discussed the manifest of open innovation. Open innovation is believed as a strategy to improve company performance [4] as well as economic performance and innovation [6]. Many research show a significant relationship between disclosure and company performance [4], [6]. According to research from Liang, Chen, and Geok-Pee [35] higher levels of open innovation were found to lead to a higher organizational performance.

Table 10 presents a list of previous studies that discussed open innovation manifest in organization. Open innovation can manifest in the form of inbound open innovation, coupled open innovation, outbound open innovation, open innovation practices, open innovation process, open innovation proclivity, and open innovation adoption. Table 9 presents a list of previous studies that discussed the relationship between open innovation and organizational performance. The relationship between open innovation and organizational performance discussed in previous studies is the relationship between innovation processes, open innovation, and performance organization. Therefore, organizations can consider adopting open innovation practices as a mean to improve their performance, which can be in the form of innovation or financial performance.

This research offers several references from reputable journals explaining the relationship between open innovation and organizational performance. There are also dimensions that affects open innovation activities and practices in either small, medium, or big-scaled organization such as inbound open innovation, outbound open innovation, and coupled open innovation. Each of these dimensions could contribute differently to the attainment of organizational performance. Table 2 and 3 also shows that the relationship between open innovation and organizational performance could also occur specifically within the organizational performance dimension itself, i.e., financial performance, operational performance, and technological performance. From Figure 2 to Figure 6, the total and mapping of research on the positive relationship between open innovation and organizational performance are presented including the organizational context such as scale and type within which the research was conducted. The mapping reflects an upward trend or interest for organizations to increase internal capabilities to improve performance. This serves as an indication that further research is necessary to help guide organizational leaders to maintain and improve organizational performance.

The systematic literature review conducted in this paper serves as a foundation for future research that discuss policy strategies to improve organizational performance through open innovation implementation. Additionally, the research outcome could also be used as a preliminary study for studies on improving internal innovation capabilities and external innovation exploration. In the present context, this paper could also be a reference for studies that aim to improve organizational performance within the context of the current pandemic as innovation is needed to overcome various limitation within this difficult time. The limitations include but not limited to interaction with consumers, suppliers, and other stakeholders. Such a limitation would be
more detrimental for the SMEs in which digitalization of operational activities has not been maximized or even initiated. Therefore, an innovation that is sustainable like open innovation is needed to maintain the existing organizational performance, if not to improve it.

Based on the reference search process in the systematic literature review in this study, a more specific and detailed mapping will be obtained regarding the impact of open innovation preparation on performance in an organization. The literature used is divided into several specifications that provide more explanation about the contribution of each aspect of open innovation in it. Open innovation is based on the level of use or adoption, the type of organization, and the type of open innovation implemented in the organization as well as the interaction of open innovation with the type of performance in the organization. This finding becomes one of the important references in formulating policies within the organization, especially in the face of increasingly fierce business competition.

This study provides an overview of the impact of the open innovation preparation process on organizational performance. The literature searched that has been carried out shows the manifestation or role of open innovation in organizational activities. Open innovation in various types, namely inbound OI, outbound OI or coupled OI is a manifestation of the organization to support the achievement of better performance. Each organization can apply different types of open innovation according to the needs and specifications of its business field. Furthermore, with the SLR generated in this study, leaders or top management in an organization can internalize their needs to further determine and implement the suitable type of open innovation in improving organizational performance.

IV. CONCLUSION AND RECOMMENDATION

This research contributes to providing a more updated, comprehensive, and clearer illustration on the importance of an organizational readiness to innovate, especially through open innovation. The involvement with both internal and external stakeholders is an essential component of open innovation, which is why organizations need to thoroughly understand each aspect or variable that could determine a successful open innovation. Open innovation needs to be done in an organization because it provides positive contributions to a betterment of organizational performance.

According to this systematic literature review, most organizational performance is determined by internal innovation factors. It can be concluded that in this study, a systematic literature review was carried out to gain more insight into the relationship between open innovation and organizational performance. There are fifteen studies that were selected as main articles for this review, in which three types of open innovation on organizational performance are identified, namely Inbound OI, Outbound OI and Coupled or Paired OI. This study also illustrates some of the proven organizational performance that is scientifically influenced by open innovation as well as the means by which different organizations implement open innovation – a benchmarking opportunity for organizations.

However, this paper also has some limitations that are worth mentioning. First, the literature review performed in this paper is derived from two well-established databases. In order to achieve an even more comprehensive result, other electronic databases can be included in the study. Second, this study did not differentiate the effect of OI towards organizational performance in different size of company. There might be differences between the OI practice in small and medium enterprise (SMEs) and big organization or companies. Third, the 33 main articles selected for this research did not elaborate the possible drawbacks that occur throughout the process of open innovation such as high coordination cost and uncertainty of profit generation [19]. Therefore, the effect of these phenomena may not be reflected in the relationship between OI and organizational performance. Nevertheless, there is an acknowledgment on how these drawbacks may reflect the nature of initiating and executing an open innovation process.

For further research, discussions regarding the effect of open innovation on organizational performance can be examined within nonprofit organizations, government, and other contexts, to examine other ways in which organizations pursue open innovation. Additionally, it might be beneficial to analyze to what extent the drawbacks from open innovation process would hinder what appears to be the advantages from doing open innovation. Based on the result of this research, several follow-up research can be conducted which include:

a. The urgency of conducting innovation, especially open innovation that involves internal and external stakeholders and improving the open innovation capabilities in an organization
b. The effort of an organization to optimize its performance through open innovation capabilities and practices whereby open innovation significantly influences the attainment of performance improvement in an organization
c. The implementation of policy strategies under an emergency due to the heightened limitation caused by the pandemic. Open innovation becomes one of the means for an organization to innovate in this current situation. Unfortunately, given that the limitation of interaction with stakeholders could negatively affect the organizational performance, a more comprehensive understanding on open innovation is needed to mitigate such an impediment
d. The determination of priority variables that could support open innovation the most to optimize the organizational performance. Given the option of having inbound open innovation, outbound open innovation, and coupled open innovation, each organization may likely to have different priorities and capabilities to realize open innovation depending on specific organizational contexts including innovation environment or culture developed by the organization.
REFERENCES

[1] H. Chesbrough, **Open Innovation: The New Imperative for Creating and Profiting From Technology.** Boston, MA, USA: Harvard Business Press, 2003.

[2] R. Reed, S. Storrudd-Barnes, and L. Jessup, “How open innovation affects the drivers of competitive advantage: Trading the benefits of IP creation and ownership for free invention,” *Manage. Decis.*, vol. 50, no. 1, pp. 55–73, Feb 2012, doi: 10.1108/00251921211248777.

[3] K. Laursen and A. Salter, “Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms,” *Strategic Manage. J.*, vol. 27, no. 2, pp. 131–150, Feb. 2006, doi: 10.1002/smj.507.

[4] S. Lee, G. Park, B. Yoon, and J. Park, “Open innovation in SMEs—An intermediated network model,” *Res. Policy*, vol. 39, no. 2, pp. 290–300, Mar. 2010, doi: 10.1016/j.respol.2009.12.009.

[5] A. Gambardella and C. Panico, “On the management of open innovation,” *Res. Policy*, vol. 43, no. 5, pp. 903–913, Jun. 2014, doi: 10.1016/j.respol.2013.12.002.

[6] J. M. Ahn, Y. Ju, T. H. Moon, T. Minshall, D. Probert, S. Y. Sohn, and L. Mortara, “Beyond absorptive capacity in open innovation process: The relationships between openness, capacities and firm performance,” *Technol. Anal. Strategic Manage.*, vol. 28, no. 9, pp. 1099–1108, Oct. 2016, doi: 10.1080/09537325.2016.1181737.

[7] A. Schroll and A. Mild, “Open innovation modes and the role of internal R&D: An empirical study on open innovation adoption in Europe,” *Eur. J. Innov. Manage.*, vol. 14, no. 4, pp. 475–495, Oct. 2011, doi: 10.1080/14601061111747025.

[8] P. Haapalainen and J. Kantola, “Taxonomy of knowledge management in open innovations,” *Proc. Manag.*, vol. 3, pp. 688–695, Jan. 2015, doi: 10.1016/j.promfg.2015.07.007.

[9] E. R. Huizingh, “Open innovation: State of the art and empirical evidences from the bio-pharmaceutical industry,” *Int. J. Technol. Manage.*, vol. 70, no. 2–3, pp. 199–214, Mar. 2015, doi: 10.1108/14601061211248660.

[10] M. Inauen and A. Schenker-Wicki, “The impact of outside-in open innovation strategies and stages in the Turkish food and beverage pharmaceutical industry,” *Technol. Forecasting Social Change*, vol. 70, nos. 2–3, pp. 108–123, Aug. 2010, doi: 10.1016/j.techfore.2010.05.014.

[11] B. Ebersberger, C. Bloch, S. J. Herstad, and E. Van De Velde, “Open innovation processes and their effect on innovation performance,” *Int. J. Technol. Manage.*, vol. 9, no. 6, Dec. 2012, Art. no. 1250040, doi: 10.1142/S021987701250040X.

[12] Y. Wang, N. Roijakkers, W. Vanhaverbeke, and J. Chen, “How Chinese firms employ open innovation to strengthen their innovative performance,” *Int. J. Technol. Manage.*, vol. 59, nos. 3–4, p. 235, Oct. 2012, doi: 10.1057/ijtm.2012.047245.

[13] A. A. Rumanti, I. Sunaryo, I. I. Wiratmadja, and D. Irianto, “Cleaner production through open innovation in Indonesian batik small and medium enterprises (SME),” *TQM J.*, early access, Dec. 2020, doi: 10.1108/TQM-04-2020-0086.

[14] M. Inauen and A. Schenker-Wicki, “The impact of outside-in open innovation on innovation performance,” *Eur. J. Innov. Manage.*, vol. 14, no. 4, pp. 496–520, Oct. 2011, doi: 10.1108/14601061111174934.

[15] B. Bigliardi, A. I. Dormio, and F. Galati, “The adoption of open innovation practices and their effect on innovation performance,” *Eur. J. Innov. Manage.*, vol. 15, no. 1, pp. 27–54, Jan. 2012, doi: 10.1108/14601061211238285.

[16] S. Popa, P. Soto-Acosta, and I. Martinez-Conesa, “Antecedents, moderators, and outcomes of innovation climate and open innovation: An empirical study in SMEs,” *Technol. Forecasting Social Change*, vol. 118, pp. 134–142, May 2017, doi: 10.1016/j.techfore.2017.02.014.

[17] K.-P. Hung and Y.-H. Chiang, “Open innovation proclivity, entrepreneurial orientation, and perceived firm performance,” *Int. J. Technol. Manage.*, vol. 52, nos. 3–4, pp. 257–274, 2010, doi: 10.1057/ijtm.2010.05976.

[18] Y.-H. Chiang and K.-P. Hung, “Exploring open search strategies and perceived innovation performance from the perspective of inter-organizational knowledge flows,” *R D Manage.*, vol. 40, no. 3, pp. 292–299, Feb. 2010, doi: 10.1111/j.1467-9310.2010.00558.x.

[19] T. P. Liang, D. N. Chen, and L. G. Pee, “The impacts of open innovations on organizational performance: A perspective based on information technology and knowledge ecology,” in *Proc. Int. Conf. Inf. Syst. (ICIS)*, 2013, pp. 1–15.

[20] P.-H. Ju, D.-N. Chen, Y.-C. Yu, and H.-L. Wei, “Relationships among open innovation processes, entrepreneurial orientation, and organizational performance of SMEs: The moderating role of technological turbulence” in *Proc. Int. Conf. Bus. Inform. Res.*, 2013, pp. 140–160.
