RESEARCH ARTICLE

Open Innovation in Organization Through Stakeholder Capability During Pandemic (COVID-19): Indonesian SMEs Perspective

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ABSTRACT This study aims to analyze the role of stakeholders who support the open innovation transition in SMEs. This is important because the innovation process has shifted from closed innovation to open innovation which requires good management of organizational capabilities, especially in managing stakeholders and resources owned by the organization. However, in the current pandemic situation, SMEs have challenges in adopting and implementing these open innovations. In this study, a conceptual research model was compiled and produced which elaborated several previous references, and then tested empirically on respondents, namely in SMEs in Indonesia. The responses involved in this study were 218 SMEs, but the complete response are 206 respondents. Data testing was carried out using the Partial Least Square-Structural Equation Modeling (PLS-SEM) statistical method. The results of hypothesis testing indicate that there are four variables that significantly strengthen the effect of closed innovation on open innovation, namely financial capability, network, knowledge management system, and organizational culture (p < 0.01). The moderating variable with the most dominant influence is financial ability ($\beta = 0.915$, p < 0.01). Based on the results of this study, SMEs that have high financial capabilities or have advantages in terms of funding and financial management can make the transition from closed innovation to open innovation better or independently. There is one moderating variable that is not proven to be significant, namely technology. These findings can then be used to formulate appropriate policies to support the adoption of open innovation in the context of developing the ability of SMEs to survive during the pandemic.

INDEX TERMS Open innovation, closed innovation, Stakeholder, SMEs, pandemic.

I. INTRODUCTION

The development of innovative activities today is one of the critical factors for organizations to be able to survive, especially in facing fierce competition [1], [2]. In addition, the ability to innovate in an organization can show its readiness to overcome various conditions or situations that are increasingly uncertain [3]. Successful innovation can bring uniqueness to an organization that is not owned by other organizations so that it can be an advantage for the internal

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organization [1]. Innovation is a process of increasing capabilities that must be owned by organizations, both large, medium, and small scales [1]. Innovation begins with a continuous improvement in the organization's capabilities [2]. Several SMEs are currently facing challenges related to the balance between economic, social, and environmental factors [4]. Therefore, SMEs need a method or strategy to be able to carry out innovation optimally [5]. Innovation in SMEs can be started by making improvements in the organization's internal activities. The progress of the current innovation process has shifted from closed innovation to open innovation [6]. The dynamics of the current innovation process are

increasingly moving towards open innovation. Open innovation is one way that can be done to improve an organization's ability to innovate.

In open innovation the knowledge that is used to drive innovation, can be obtained from external or internal organizations, ranging from small to large scale [5], [6]. Open innovation can be started with positive changes through creative and destructive new ideas that involve various parties such as suppliers, consumers, competitors, and the public [6]. Support from the government in creative destruction can be applied to the rules and regulations that take place in an area [7]. Innovations that are carried out internally and involve external stakeholders are known as open innovations [8]. These stakeholders include suppliers, government, educational institutions, funding institutions, Non-Governmental Organizations (NGOs), communities, and consumers. Stakeholders are one source of knowledge for innovation activities for owners and workers in SMEs [7], [8]. Open innovation can explore sources of innovation both from outside the organization (inbound) and those generated by the organization (outbound), which are used to accelerate internal innovation, expand markets, and generate external innovations for other organizations [8]. Open innovation has a strong relationship with company resources, as well as a dynamic capability perspective within an organization. Open innovation can be supported by the readiness of every party involved in the organization, from individuals, groups, or management within the organization [9], [10].

The adoption and implementation of open innovation in SMEs will play an important role for SMEs in accessing external resources owned by partner organizations in conducting open innovation [11]. Open innovation is one of the contemporary paradigms in the implementation of innovation today because in open innovation, there are elements of collaboration, shared creativity, and the achievement of new knowledge and management in an organization [12], [13], [14]. Open innovation only occurs when organizations or SMEs can collaborate with other organizations through active collaboration and contribution to market exploitation, market testing, or by conducting customer needs analysis. Given the limited resources available, SMEs must be able to find ways to achieve economies of scale in production, market their products effectively, and provide support services that satisfy consumers. Collaborating with other organizations is one-way SMEs use the concept of open innovation. Currently, SMEs are expected to be able to be more flexible and more innovative, but in general, they still lack in terms of resource availability [15]. Therefore, the role of stakeholders will greatly assist SMEs' efforts to achieve and implement open innovation more consistently [15].

This research is identified and investigates changes in the innovation process, from closed innovation to open innovation. These changes need to be made because of the increasingly complex sources of innovation that do not only come from internal organizations but also from external parties.

Moreover, facing the pandemic period experienced by all business actors of all scales, both small, medium and large scales. Then the next problem to be solved in this study is to identify and measure the role of stakeholders in supporting the change from closed innovation to open innovation, especially for SMEs during the pandemic, where these stakeholders can provide active support for SMEs to accelerate their capabilities. To innovate from closed innovation. Become an open innovation, especially during the current pandemic. This research was conducted by observing and concerning the conditions of the innovation process that occurred in small and medium-scale industries, especially during a pandemic. In recent years, organization leaders have begun to be concerned about their ability to innovate. Current conditions show that innovation is one of the important factors in achieving the success of a business, both in small, medium and large-scale businesses [16]. Most organization leader still apply closed innovations that have not actively involved external stakeholders in the innovation process, so the innovations carried out rely on the capabilities and knowledge that exist within the organization or company's internal [6], [17]. For large-scale business organizations or companies, it is still possible to close the innovation process in a closed manner while still providing support to the organization's goals because of the financial capabilities that support the availability of facilities, technology, information and other sources of knowledge. However, this is different from the case of small and medium-sized enterprises whose financial capabilities are generally limited [6], [8], [16], especially in facing the current global competitive situation.

Along with current global developments, closed innovation has not been able to optimally support business people to achieve organizational or company goals, especially in small and medium businesses. Therefore, these organizations or companies need to improve their ability to carry out open innovation processes [16]. Open innovation is an innovation process that involves every stakeholder, both internal and external. Open innovation allows organizations or companies to innovate optimally, were sources of knowledge and information can come from internal and external organizations [6], [16].

The open concept of open innovation allows an organization or company to get all sources of knowledge and information from various parties to then collaborate with the innovation sources that it already owns internally [6], [8]. This is of course very beneficial for small and medium scale businesses such as SMEs which generally have limitations in various ways, for example: limited financial capacity, facilities and equipment, information sources and so on. Open innovation provides opportunities for small and medium enterprises (SMEs) to survive and improve their ability to compete with other business actors [6], [8], [17]. In this study, stakeholders are parties involved in providing or assisting small and medium enterprises (SMEs) in several ways that support the change from closed innovation to open innovation. Factors supporting these changes are knowledge

management system, financial, strategic management, networking and organizational culture.

The challenges of SMEs in adopting and implementing open innovation at this time will be even more severe with the pandemic conditions that hit the whole world. This is a very significant challenge for SMEs because most of their innovation resources come from outside the organization [18]. SMEs must be able to seek various ways to gain access to resources to implement open innovation [18], [19]. The implementation of the open innovation process can be done well if the organization can manage its corporate culture, networking, organizational structure, and knowledge management systems [19]. Previous research on the achievement of open innovation from the closed innovation process shows that an open innovation strategy in an organization can be carried out through increasing organizational capabilities in aspects/factors of knowledge, financial capability, technology strategy, collaboration, and organizational culture [20]. Pandemic conditions require new ideas or breakthroughs that can assist organizations in implementing open innovation [21]. The existence of limited access and activities during the pandemic needs to be overcome by optimizing aspects or factors that support virtual open innovation, such as implementing information technology and information management systems [22], [23].

The contribution or novelty of this research is to propose a research model and at the same time carry out empirical measurements to show the transformation process from closed innovation to open innovation in SMEs, especially facing the current pandemic. This research also provides a contribution or novelty that explains the role of stakeholders in assisting the transformation process, where stakeholders are parties who can provide support in preparing several aspects to improve the ability of SMEs to achieve open innovation, where the aspects discussed in this study are knowledge management systems, financial, strategic management, networking and organizational culture.

In this study, a value-added can be obtained, both in terms of conceptual and also empirically. From the conceptual side, this research proposes a research model through the elaboration process of various previous studies that explain closed innovation and the factors that act as moderators in the process towards or achieving open innovation. The research model was originally a conceptual model, which was then tested empirically in this study. From the empirical side, the value added resulting from this research is the research model that can identify and evaluate the process of changing closed innovation to open innovation with stakeholder support. Stakeholder support can be measured through several aspects, namely: knowledge management systems, financial, strategic management, networking and organizational culture. Through this research, SMEs can implement the open innovation process from the previously closed innovation. This needs to be done because the current global conditions require the ability to cooperate with external parties, that is stakeholders to be able to compete globally. In addition,

SMEs can also optimize the role of stakeholders in supporting the change from closed innovation to open innovation, especially for SMEs because of several weaknesses that SMEs have, especially in financial capability.

Based on several studies that have previously been described, this study aims to identify and analyze the role of stakeholders in SMEs, especially in SMEs' efforts to achieve open innovation from the previous conditions which were still innovating by only involving internal parties (closed innovation). The achievement of SMEs in conducting open innovation is an important matter because the innovation process has shifted from closed innovation to open innovation which requires better management of organizational capabilities. In the open innovation process, SMEs must be able to manage all the resources they have and the stakeholders involved, especially those involving external SMEs. This research also conducts an empirical study to identify and measure the process that measures what factors need to be prepared by SMEs business actors with the support of their stakeholders to change their innovation process from closed innovation to open innovation. The paper structure in this research consists of several sections, namely: Introduction, Literature Review and Hypothesis Development, Methodology, Result Analysis, Discussion, and Conclusion.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Innovation is the key aspect of developing and increasing competitiveness in large, medium, and small-scale companies [1], [2], [3]. In the face of challenges and rapid technological changes, innovation is one means of overcoming them [23]. With innovation, it is hoped that the uniqueness of a company can emerges and become a differentiator from other companies. In the end, it can increase profits for companies [1] that innovate both related to products and processes.

A. CLOSE INNOVATION

Closed innovation is an innovation activity that involves all aspects and factors sourced from within the organization to produce the organization's products or services [19], [20]. There are factors that influence innovation ability, including leadership style, organizational culture, knowledge management [24], social capital, and business strategy [25]. These factors emphasize more on the company's internal ability to innovate. Along with the bigger and more complex challenges faced by organizations/companies and in order to advance the company, the innovations that are carried out are slowly shifting from closed innovation to open innovation. Several studies discuss the transition from closed innovation to open innovation [5], [6].

B. OPEN INNOVATION

Open innovation is defined as innovation that involves sources of innovation from an outside organization (inbound) or generated by the organization (outbound) to accelerate internal innovation, expand the market, and generate external

innovation for other organizations [8], [26]. Open innovation is divided into two activities, namely inbound open innovation and outbound open innovation. Inbound open innovation is knowledge inflows that enable organizations to explore and acquire new knowledge and technologies from external sources such as customers, suppliers, competitors, governments, consultants, universities, or research organizations [8], [26]. Meanwhile, outbound open innovation is an innovation activity that exploits internal ideas or technological knowledge flowing from the organization through licensing patents or contractual agreements to obtain monetary and non-monetary benefits [8], [26].

C. FROM CLOSE INNOVATION TO OPEN INNOVATION

Open innovation activities begin with closed innovation, which is carried out simultaneously and continues within an organization [5]. However, new efforts or strategies are needed in implementing activities related to open innovation in an organization [5], [6]. Based on the literature review described earlier, in this study, the first hypothesis was formulated, namely:

H1: Closed innovation has an influence on the achievement of open innovation in the organization

In the practice of open innovation, the relationship and contribution between the level of collaboration, motivation, partners/partners, and leadership are important things to give attention [27], [28]. Thus, in the application of the concept of open innovation, it is a must to be able to use technology with an emphasis on collaboration between internal and external entities of the organization/company [29].

Regarding collaboration, it will be related to stakeholders. The role of stakeholders in supporting open innovation activities [7], [26]. These stakeholders can provide ideas, either from outside or from within the company, and then use them by the company [30]. Initially, innovation is based on what has been done. This shows that innovation is carried out to improve activities within the company. Innovation that involves external parties (relevant stakeholders) to improve internally is known as open innovation [8]. In other words, stakeholders are one of the important factors that influence open innovation.

In the current pandemic, small and medium-sized companies or SMEs face enormous challenges. The impact is very large felt by SMEs due to the Enforcement of Restrictions on Community Activities (ERCA). Therefore, innovations made by SMEs are very important to be researched. The implementation of open innovation in SMEs in general (not specifically related to the pandemic) [12], [13], [14]. These studies examine the role of open innovation in SME development and implementation. The transition from closed innovation to open innovation in SMEs activities requires looking at the factors that influence this. One approach that can be used is the stakeholder approach.

The proposition of a framework for open innovation in SMEs activities, by showing the related factors [19]. In addition, this study also identifies the stakeholders involved, both internal and external, in the company in the open innovation process and their functions/roles. Thus, a collaboration between stakeholders is important in the transition from closed innovation to open innovation in SMEs activities. Previous research explores the factors that facilitate or hinder collaboration between stakeholders in open innovation [19]. However, in implementing open innovation, especially in dynamic conditions, there are consequences and challenges face by SMEs [19], [20], [21], [22]. In the course of changing closed innovation to open innovation, SMEs faces various changes in their organization. SMEs must be able to stimulate and manage changes related to four dimensions of the company, namely culture, network, organizational structure, and knowledge management system (KMS) [20]. Furthermore, this study also explains the challenges faced by SMEs in dealing with openness and formalization.

In open innovation activities, knowledge management is an essential aspect. It is because, knowledge management will enable the organization to anticipate, implement, adapt, and develop its operations by utilizing information and competencies both internally and externally [31]. With the development of ICT, many organizations have developed a knowledge management system to facilitate the creation, sharing and storage of knowledge [32]. Knowledge management system refers to information systems applied to manage organizational knowledge and to improve the creation, storage, transfer, and application of knowledge. A knowledge management system can create infrastructures and an environment that positively contribute to organizational knowledge management by developing internal knowledge management capabilities. Through its capability, it has been argued that Knowledge Management System facilitates open innovation process [32]. Unfortunately, due to limited resource, SMEs face difficulties affording ICT platforms and often deny the need for a knowledge management system. But, in open innovation environment, knowledge management system is highly important interactions exist between organization [20]. In the migration from close to open innovation, the existence of knowledge management system will make organization readier facing the change that might arise due to its ability to foster the creation of an open and collaborative ecosystem. Knowledge management system also help organization to open up innovation process in SME through leveraging internal and external knowledge flow [20]. Thus, in this study the following hypothesis is developed:

H2: Knowledge management system strengthens the influence of closed innovation on the achievement of open innovation in the organization

Financial condition still become issue in implementing open innovation process in organization. It is undeniable that the implementation of open innovation requires relatively large costs, especially for SME [19]. Limited financial support and high costs might block the success of open innovation in SMEs [19]. Many SMEs that are struggling

implementing open innovation have a lack of a cost-planning strategy and inconsistent as well as inadequate financial support, where those issues could affect the open innovation process [19]. Organization that has successfully develop open innovation suggest that in the transition from close to open innovation, organization need to develop financial strategy for open innovation as well as plan budgets and costs for open innovation budget. Thus, this study formulated the following hypothesis:

H3: Financial provides strengthening the influence of closed innovation on the achievement of open innovation in the organization

The shifting from close to open innovation will affect organization's innovation management process. The adoption of open innovation will make internal and external organization parties such as manager, customers, employee, suppliers, etc. interconnected differently [33]. This suggest that one of aspects to embrace open innovation is utilize technology that can support the process of connecting knowledge, as well as supporting knowledge transfer and transformation that is required [33]. This journey requires to be supported by strategic technology developed by stakeholder. Strategic technology will guide SMEs in determining which technology best for supporting open innovation implementation. Without proper strategic technology, SMEs might adopt wrong technology for open innovation adoption. Thus, in this study we formulated following hypotheses:

H4: Strategic technology strengthens the influence of closed innovation on the achievement of open innovation in the organization

The migration from close to open innovation means organization will have an open and collaborative ecosystem. The collaboration process requires active participation from a network that consists of suppliers, product users, and expertise. The collaboration of the parties in the network can bring in priceless know-how and also widens the scope for discovering new solutions and ideas [19], [20]. Thus, the transformation from close to open innovation activities arise the need of enlarging network. Through this network, organization can obtain feedback, opinions, and suggestion that is useful in product development [20]. In sum, networking can help organization enabling open innovation process. Therefore, this study formulated the following hypothesis:

H5: Networking strengthens the influence of closed innovation on the achievement of open innovation in the organization

In the transformation from close to open innovation, organizational culture might become enabler or barrier [20], [34]. The shifting from close to open innovation will arise the cultural change faced by organization [18]. Unfortunately, SMEs with the characteristic where they often have limited resource, limited external contacts, and lack of processes and procedures to react quickly make them not aware with the warnings for change [18]. In sum, SME often possess organizational culture that can obstruct open innovation

implementation. Many SMEs face difficulties in implementing open innovation due to their reluctant to accept the openness. The organizations that are already successfully involved in open innovation suggest that they already developed an organizational open innovation (OI) culture [34]. It can be said that organizational culture that motivate openness can expedite the transformation from close to open innovation practice. Thus, this study formulated the following hypothesis:

H6: Organizational culture strengthens the influence of closed innovation on the achievement of open innovation in organizations

Based on the description of the literature above, many studies have been carried out related to the transition of companies, in this case, the SMEs, from closed innovation to open innovation using a stakeholder approach in dynamic conditions in general. However, there is still little research that discusses how to make the transition from closed innovation to open innovation by SMEs, using a stakeholder approach, specifically related to conditions facing the pandemic period. Therefore, in this study, a more in-depth discussion is carried out regarding the contribution of each stakeholder, both internal and external stakeholders to support the transition process from closed innovation to open innovation. This research is expected to help SMEs to transform from closed innovation to open innovation, especially during the current pandemic.

III. RESEARCH METHODOLOGY
In this study, research model development, measurement and testing of factors or aspects that play a role in the process of changing closed innovations into open innovations are carried out. Factors that can affect the readiness of SMEs to achieve open innovation from closed innovation are knowledge management systems, finance, strategic management, networks and organizational culture. Based on the results of measurement and testing through a research model involving these factors, the condition of the factors supporting innovation in SMEs in achieving open innovation can be evaluated. In this research model, stakeholders are moderating variables that provide a strengthening influence on the change from closed innovation to open innovation in SMEs. Stakeholders provide strengthening influence through knowledge management systems, financial, strategic management, networking and organizational culture needed by SMEs in achieving open innovation from closed innovation. The role of stakeholders is to provide support to SMEs to optimize the output of each supporting factor in an effort to achieve open innovation through closed innovation. Stakeholders are innovation resources, both internal and external to SMEs, who provide support through each of the factors or aspects described so that SMEs can carry out open innovations.

Open innovation is a new paradigm that provides reinforcement for efforts to achieve better organizational performance [35]. Open innovation can adopt innovations from both internal and external, thus enabling organizations to
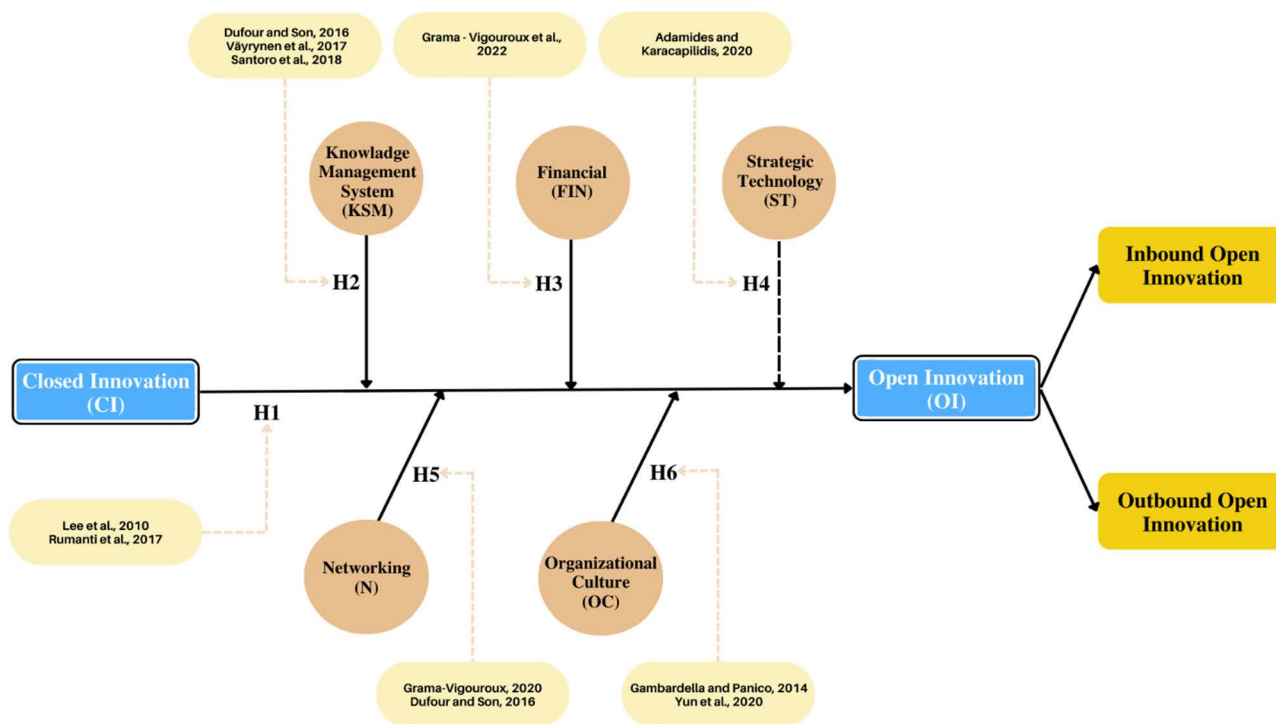
FIGURE 1. Elaboration scheme for research model.

innovate by adopting technology from external organizations while also contributing their own innovations to external organizations [8]. Therefore, it is very important for every organization including SMEs to be able to transform from closed innovation to open innovation activities. The transformation process involves stakeholders, both internal and external. Stakeholders can contribute to several aspects, namely knowledge management systems, finance, strategic technology, networking, and organizational culture [19], [20]. Based on this explanation, this article will analyze the transformation process of closed innovation into open innovation activities.

Therefore, it is very important for every organization, including SMEs, to be able to transform from closed innovation to open innovation activities. The transformation process involves stakeholders, both internal and external. Stakeholders can contribute to several aspects, namely knowledge management systems, finance, strategic technology, networking, and organizational culture [19], [20]. Based on this explanation, this article will analyze the transformation process of closed innovation into open innovation activities with the support of stakeholder moderation. The description of the elaboration scheme of the research model is presented in Figure 1.

A. SAMPLE AND DATA COLLECTION
Data collection in this study was carried out in two stages. The first stage is a preliminary study (pilot test) to test the validity and reliability of the measuring instrument in this study. At this preliminary stage, questionnaires were distributed to 30 respondents/SMEs who were randomly selected from all data on written batik SMEs in Lasem, Rembang Regency, Central Java, and Madura Island, East Java. Based on the responses to the questionnaires obtained in the preliminary study, several improvements were made to the narrative of the questionnaire. Based on the initial questionnaire that has been collected, there are several statement items or questions that must be changed in the sentence structure. This improvement is intended to make it easier for respondents to understand the meaning of the questions asked. Questionnaire responses obtained in the preliminary stage of the study were not included in the final sample of the study.

The second stage is data collection carried out in March to April 2022. The population in this study is the owners of batik SMEs located in Lasem, Rembang Regency, Central Java, and Madura Island, East Java. The sampling technique used in this study is a non-probability sampling method with a convenience sampling approach, where respondents are selected based on ease of access to researchers. The number of samples taken from the population is five to ten times the number of variables used in the analysis design and at least 200 samples [36], [37].

The number of questionnaires distributed in the number of questionnaires were distributed by researchers directly, and through fellow researchers who are technical support from several parties related to batik SMEs in Lasem, Rembang and Bangkalan, Sumenep, and Pamekasan districts in Madura.

East Java. The number of questionnaires distributed did not reflect the number of individuals who filled out the questionnaire because not all of the questionnaires distributed were collected entirely. The number of questionnaires collected in the overall response that is filled out by the leadership or owner of the written batik SMEs who are the respondents in this study. The number of questionnaires received by the researcher was 206 out of a total of 218 questionnaires distributed, so the response rate for this study was 94.49%. Meanwhile, based on the results of checking the quality of filling out the questionnaires, 206 questionnaires that meet the requirements for further processing.

B. INSTRUMENT DEVELOPMENT

In this study, the data used were based on the results of distributing and filling out qualitative questionnaires. All constructs and measurement instruments included in this study were developed from the literature. Measurement items for closed innovation construct (CI) consist of several dimensions, namely knowledge management system, financial, networking, strategic technology, and organizational culture [19], [20]. Open innovation (OI) consists of inbound open innovation and outbound open innovation [8], [26], [35]. To ensure that the data collected is quantitative data, the answers to the questions in the questionnaire use a Likert scale from number 1 to number 5. A Likert scale of 1 indicates strongly disagree, while a Likert scale of 5 indicates strongly agree. The selection of the Likert scale was carried out with the consideration that the Likert scale was more suitable for the general type of respondent, namely using a scale of 5 [37].

C. OPERATIONAL OF CONSTRUCT

In this study, the dependent variable is open innovation, while closed innovation is the independent variable. Knowledge management system, financial, strategic technology, networking, and organizational culture are moderator variables that function to provide reinforcement for the transformation process of closed innovation to open innovation.

1) INDEPENDENT VARIABLE

The independent variable in this study consisted of closed innovation. There are five moderator variables that are also independent. The moderator variables are knowledge management system, financial, strategic technology, networking, and organizational culture. Each moderator variable has a contribution to having a strengthening effect on the relationship between closed innovation and open innovation.

2) DEPENDENT VARIABLE

In this study, the dependent variable is open innovation. Open innovation has two dimensions that can reflect open innovation, namely inbound open innovation and outbound open innovation. Organizations can achieve an optimal level of open innovation if they can optimally carry out inbound open

innovation activities (getting influence from external organizations) and outbound open innovation (innovations carried out internally to be shared with external organizations) [35].

D. DATA ANALYSIS

In this study, PLS-SEM was used for data processing and model testing. In this research model, data were obtained from 206 respondents. If using the 10:1 ratio, then the minimum required the number of samples has been met in this study [38]. PLS-SEM is not much affected by the small sample size because this technique analyzes one construct at a time by applying an iterative sequence of ordinary least squares and multiple linear regression [37], [39].

In estimating the significance of the relationship, PLS-SEM uses a bootstrap approach that does not require parametric assumptions. Therefore, PLS-SEM is suitable for analyzing sample data with small numbers and is not normally distributed [37]. In addition, PLS-SEM also does not require homogeneity in data processing [37]. The data used in this study were 206 respondents from two observation locations with different distributions, namely 106 respondents in Madura and 100 respondents in Lasem. The character of each research object can be said to be similar because of the similarity in carrying out the observed process, namely the batik-making process so that the amount of data is a single unit and does not describe the differences in the character of the location.

The measurement model can be evaluated based on four criteria, namely composite reliability to measure internal consistency reliability, outer loading, and average variance extract (AVE) to evaluate convergent validity, as well as cross-loading and Fornell-Larcker values to evaluate discriminant validity [37], [38]. The indicator that can be used to check the internal consistency reliability criteria is Cronbach's alpha which is based on the intercorrelation of indicators with the assumption that all indicators have the same outer loading on the construct. Another criterion that can be used is composite reliability which considers different external loads for each indicator. The composite reliability value varies between 0 and 1, with a higher value indicating a higher level of reliability. In exploratory research, the value of composite reliability between 0.6 - 0.7 is acceptable, while the value of 0.7 - 0.9 is satisfactory [37], [38], [39].

In this article, model testing consists of two steps, namely testing the measurement model and testing the structural model. Testing the measurement model aims to ensure that the research instrument is reliable and valid. Structural model testing was conducted to examine the relationship between variables, both dependent and independent variables. Testing is done through the Smart-PLS software.

In Figure 2, a structural model relationship in PLS-SEM is presented, which shows the position of the dependent variable and the independent variable in the research model that is constructed, including the dimensions of the variables.
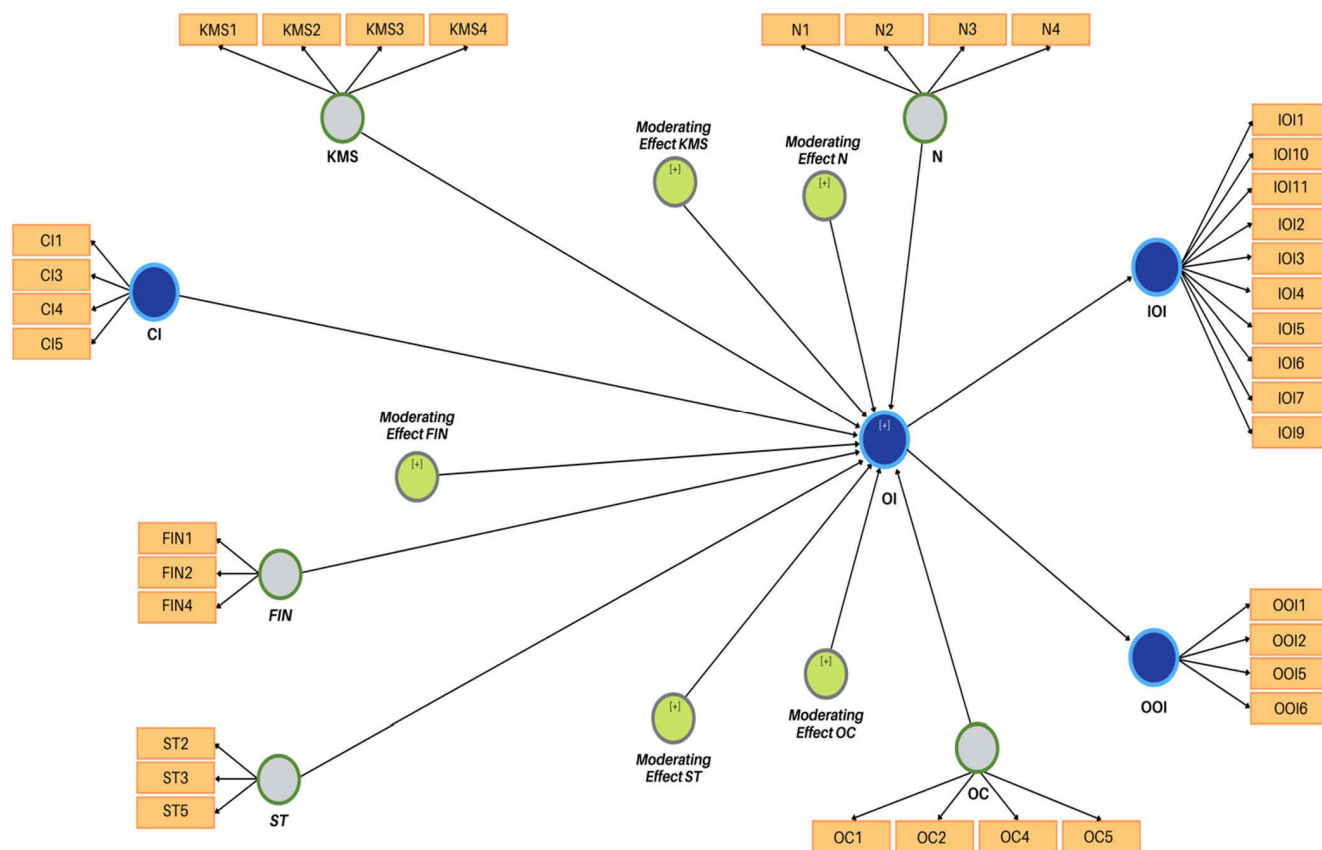
FIGURE 2. Relationship based on Measurement and Structural Model in PLS-SEM.

IV. RESULT ANALYSIS

Based on Table 1, there are 206 valid and complete questionnaire responses. A summary of the characteristics of the respondents involved in the study is shown in Table 1. The majority of the sample is located outside the center (67.96%), with most of the sample having a number of partners as many as two partners (21.84%), three partners (37.38 %), and four partners (22.82%).

According to SMEs age, 32.52% have been established for 21-30 years. There are also 11.17% of the sample who have been established for more than 50 years. In the context of batik SMEs, this industry is classified as a traditional industry that has been around for a long time. Based on the characteristics of the respondents who filled out the survey, the majority were in the age range of 40-49 years (35.92%) with the male gender (86.41%).

In terms of the annual income value, there is a change in the composition of the majority of the ranges obtained in the situation before the pandemic and after the pandemic. In conditions before the pandemic, the majority of respondents earned an average annual income of around IDR 501-750 million (38.35%), while after the pandemic, it was around IDR 251-500 million (31.07%). Batik SMEs are one of the sectors

that have been significantly affected during the COVID-19 pandemic.

Based on the number of workers, 31.07% have a workforce of around 16-20 people; 25.24% have a workforce of 11-15 people; while batik SMEs with a workforce of more than 25 people are only 8.74%. This shows that the majority of batik SMEs are still classified as small-scale home industries. While referring to the asset value, the majority of respondents have an asset value of less than IDR 1 billion (70.87%). Batik SMEs is a labor-intensive business that requires a sufficient number of workers to run its business.

Testing the measurement model using PLS is needed to evaluate the suitability of the measurement items in describing the research model developed. The test results show that all indicators on the eight constructs have an outer loading value of more than 0.7. Based on the internal reliability consistency values (shown from Cronbach's Alpha), composite reliability, and average variance extracted (AVE), which are shown in Table 2, the eight latent construct values have met the test criteria.

In the PLS measurement, composite reliability is more suitable to be used in evaluating the reliability of the measurement model compared to Cronbach's Alpha. The composite

TABLE 1. Profile of respondent.

Profile of Respondent	Category		Number of Respondent	(%)
Location	Sentra		66	32,04
	Non-Sentra		140	67,96
Age of SMEs	< 10 years		21	10,19
	11 - 20 years		58	28,16
	21 - 30 years		67	32,52
	31 - 40 years		37	17,96
	≥ 50 years		23	11,17
Respondent's Age	20 - 29 years		15	7,28
	30 - 39 years		51	24,76
	40 - 49 years		74	35,92
	50 - 59 years		46	22,33
	≥ 60 years		20	9,71
Gender	Male		178	86,41
	Female		28	13,59
Number of Workers	< 5 workers		17	8,25
	6 – 10 workers		24	11,65
	11 – 15 workers		52	25,24
	16 – 20 workers		64	31,07
	21 – 25 workers		31	15,05
	≥ 25 workers		18	8,74
Total Assets (Million Rupiah)	< 1000		146	70,87
	≥ 1000		60	29,13
Net Income/Year (Million Rupiah)	Before pandemic	0 – 250	19	9,22
		251 – 500	36	17,48
		501 – 750	79	38,35
		751 – 1000	40	19,42
		≥ 1000	32	15,53
	During pandemic	0 – 250	37	17,96
		251 – 500	64	31,07
		501 – 750	59	28,64
		751 – 1000	31	15,05
		≥ 1000	15	7,28
Number of Partner/ Stakeholders	1		5	2,43
	2		45	21,84
	3		77	37,38
	4		47	22,82
	≥ 4		32	15,53

TABLE 2. Composite reliability value and average variances extracted.

Measuring Instrument	Alfa Cronbach	Composite Reliability	Average Variance Extracted (AVE)
Closed Innovation (CI)	0.777	0.951	0.846
Inbound Open Innovation (IOI)	0.893	0.879	0.966
Outbound Open Innovation (OOI)	0.790	0.616	0.616
Knowledge Management System (KMS)	0.819	0.724	0.873
Financial (FIN)	0.758	0.621	0.766
Strategy Technology (ST)	**0.620**	**0.717**	**0.533**
Networking (N)	0.803	0.815	0.736
Organizational Culture (OC)	0.761	0.813	0.960

reliability of the eight latent constructs has a value of more than 0.6. Although the rule of thumb is that the composite reliability value is more than 0.7, the composite reliability value between 0.6 to 0.7 is still acceptable in the context of the exploratory model [38], [39]. Therefore, the eight latent constructs have met the model's reliability criteria.

Based on the average variance extracted (AVE), the eight latent constructs have a value of more than 0.5 so that the convergent validity criteria have been met [37]. Discriminant

validity testing using cross-loading values and Fornell Lacker criteria shows that the eight latent constructs have a root value of AVE that is greater than the correlation between latent variables, so that discriminant validity has also been met [38]. After the measurement model built fulfills the valid and reliable criteria, then the test is carried out for the structural model. The structural model tested the relationship between the independent variable, namely closed innovation (CI), and five moderating variables on the dependent variable, namely

TABLE 3. Significance of structure relationship.

	Hypothesis	Path Coefficient	T-Statistic	P Value	Conclusion
H1	CI → OI	0.958	80.706	0.000	Accept ****
H2	Moderating KMS (CI → OI)	0.867	7.148	0.007	Accept ***
H3	Moderating FIN (CI→ OI)	0.915	10.033	0.003	Accept ***
H4	**Moderating ST (CI→ OI)**	**-0.077**	**0.044**	**0.187**	**Reject**
H5	Moderating N (CI →OI)	0.816	11.109	0.001	Accept ***
H6	Moderating OC (CI → OI)	0.872	12.068	0.000	Accept ****

Note(s): **** significant level $\propto$ = 0.01; *** significant level $\propto$ =0.05
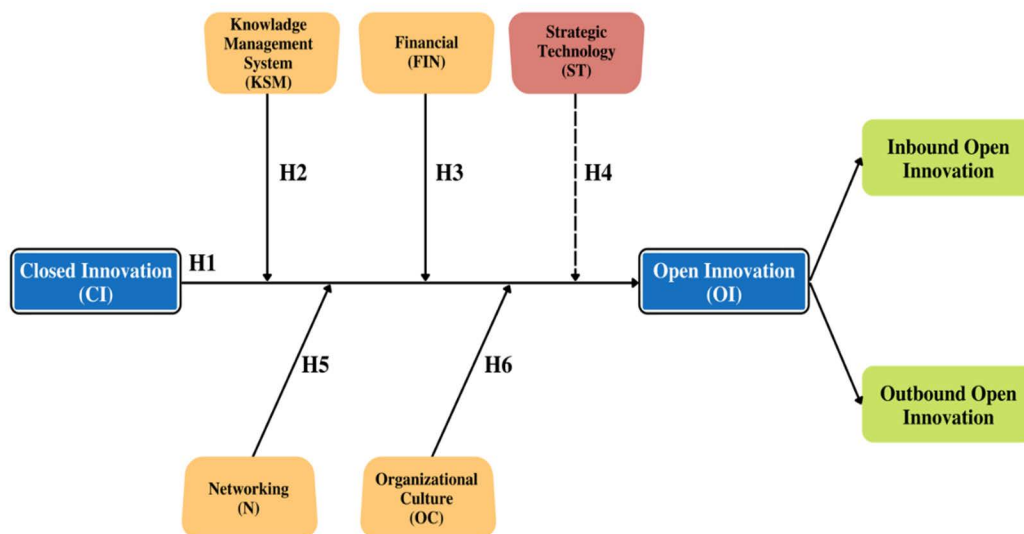
FIGURE 3. The Relation of Closed Innovation (CI) and Open Innovation (OI) Result Model.

open innovation (OI). The results of the full structural model test are shown in Table 3.

Based on the results of the structural test, it is known that closed innovation has a positive and significant effect on open innovation ($\beta = 0.958$; p = 0.000, p < 0.01). This shows that Hypothesis 1 is proven. While the results of the structural test for the effect of the moderating variable on the relationship between closed innovation and open innovation, of the five variables, it can only be proven the effect of four moderating variables (including knowledge management system (KMS), financial (F), networking (N), and organizational culture (OC)). Hypothesis 2 is proven based on the path coefficient value (β) 0.867 (p = 0.007, p < 0.01). This shows that the relationship between closed innovation and open innovation is proven to be significantly influenced by the moderating variable of the knowledge management system (KMS). The moderating variable of financial management ability has the greatest path coefficient value ($\beta = 0.915$, p = 0.003,

p < 0.01), so that Hypothesis 3 can be proven. Meanwhile, Hypothesis 4 regarding the effect of the moderating variable strategy technology (ST) on the relationship between closed innovation (CI) and open innovation (OI) could not be proven (p = 0.187, p > 0.05). The results of Hypothesis 3 testing indicate that the networking variable has a significant effect in moderating the relationship between closed innovation and open innovation, with a path coefficient value (β) of 0.816 (p = 0.001, p < 0.01). Finally, the moderating effect of organizational culture on the relationship between closed innovation and open innovation can be proven ($\beta = 0.872$, p = 0.000, p < 0.01) so that Hypothesis 6 can be supported. The test results indicate that there are four variables that can strengthen the influence of closed innovation on open innovation, namely management system (KMS), financial (F), networking (N), and organizational culture (OC).

Based on the results of the significant relationship between variables, the model with the Strategic Technology variable

has no significant effect on Open Innovation (OI), or it can be explained that hypothesis 4 is rejected in the open innovation model in the case of SMEs measurement in Madura and Lasem. Figure 3 shows the research model produced in this study in accordance with the proof of the hypothesis. There is a red dotted line which indicates the variable has no significant effect on the model, and the black line indicates a significant relationship between the variables in the model.

Based on the value of the correlation coefficient, the open innovation variable was proven to be correlated with its constituent dimensions consisting of inbound open innovation ($r = 0.993$, $p < 0.01$) and outbound open innovation ($r = 0.965$, $p < 0.01$), can be seen in Table 4. These results indicate that there are open innovation variables that can be influenced by closed innovation. In the context of SMEs, there are two dimensions that make up the variable of open innovation, consisting of inbound open innovation and outbound open innovation. Meanwhile, based on the test results of the overall structural model, it was found that closed innovation was able to explain 89.4% of the variance in open innovation ($R^2 = 0.894$), as shown in Table 5. To evaluate the model in this study, using a dependent test including collinearity test, model of fit, Chi-square test, and F test. Each test has acceptance criteria, if the test results enter the acceptance area, the model can be used for analysis results. The model adequacy criteria can be used to test the dependence of the conceptual model Open Innovation in Organization through Stakeholder Capability during the Pandemic (COVID-19). A case study on Indonesian SMEs Perspective can be seen in Table 6.

From the values shown in Table 6, it can be said that the dependent test as measured by the model of fit can already be used as the basis for analysis because it has met the model's eligibility criteria. Standardized Root Mean Square Residual (SMRS) is used to test the reflective adequacy of measurements and composite models. The result of this research shows a value of more than 0.08, so the model Open Innovation in Organization through Stakeholder Capability during the Pandemic (COVID-19) is acceptable. The normed Fit Index (NFI) results in values between 0 and 1. The closer the NFI to 1, the better the fit. NFI values above 0.9 usually represent an acceptable fit [b]. The result shows value of NFI is more than 0.9 and closed to 1, so this model acceptable. Root Means Square (RMS)_Theta is used to see the differences between predicted indicator values and the observed indicator values RMS theta values below 0.12 indicate a well-fitting model, whereas higher values indicate a lack of fit [40]. The value of PLS-SEM is 0.043 which mean less than 0.12. So, it can be explained that from the model of fit test is acceptable to be analyzed further. In addition to looking at the value of the model of fit, it is necessary to investigate further related to the relationship between variables, based on the assumption that must be met in PLS-SEM that there should be no relationship between independent variables, so it is necessary to test the collinearity between variables. One method to measure collinearity between variables in PLS-SEM is the

TABLE 8. F^2 value.

Construct	F^2
Open Innovation -Closed Innovation	0,158

Variance Inflation Factor (VIF). This test is used to test the relationship between 2 indicators in the model. Collinearity between indicators that make up the variables must be investigated using VIF because high multicollinearity can lead to insignificant estimates. From the test results, the VIF value is obtained, which is in accordance with the acceptance criteria. The explanation can be seen in the Table 7. From these results, there is no indication of the relationship between variables. So, there is no multicollinearity problem. In addition to assessing whether there is a significant relationship between variables, a researcher should also assess the magnitude of the influence between variables with Effect Size or F-square. The f square value is 0.02 as small, 0.15 as a medium, and 0.35 as large. Values less than 0.02 can be ignored or considered no effect [40]. Table 8 shows that the relationship between Open Innovation and Closed Innovation is 0.158, where the results are included in the medium because the F^2 value is in the range 0.15-0.35. The ability of the model to predict can be evaluated by the value of the model's predictive indicator on the dependent construct (Q^2). Q^2 value greater than 0 (zero) indicates that the model has predictive relevance for certain dependent constructs. Meanwhile, if the value of Q^2 is less than 0 (zero), then the model has a less relevant predictive for the dependent construct. The measurement of this indicator is applied to dependent constructs with reflective indicators [36], [37]. The value of Q2 in this study is presented in Table 9.

TABLE 9. Q^2 value.

Construct	Q^2
Open Innovation	0,285
Closed Innovation	-

From the explanation model of fit, VIF, F^2, and Q^2, the dependent test of the Open Innovation in Organization analysis results through Stakeholder Capability during the Pandemic (COVID-19) model constructs on the Indonesian SMEs Perspective shows decent results. So that the model can be used as a measuring tool.

V. DISCUSSION

This study focuses on relevant identification and exploration of the role of stakeholders in moderating the relationship between closed innovation and open innovation in SMEs. The results of a study conducted in the context of batik SMEs in Indonesia show that there are four variables that positively moderate the effect of closed innovation on open innovation, namely financial (F), networking (N), knowledge

TABLE 4. Relationship significance for open innovation with its dimension.

Relationship	Correlation Value	T- Statistic	P Value	Conclusion
Open Innovation → *Inbound open innovation*	0.993	30.691	0.000	Significant
Open Innovation → *Outbound open innovation*	0.965	7.235	0.009	Significant

TABLE 5. R^2 value.

	R Square	R Square Adjusted
Inbound Open Innovation (IOI)	0.983	0.981
Outbound Open Innovation (OOI)	0.768	0.766
Open Innovation (OI)	0.894	0.891

TABLE 6. Model of fit value.

Model of Fit	Criteria	Value	Conclusion
SMRS	0.08<SRMS<HI95	0.891	Indicating acceptable model fit
NFI	>0.9	0.921	Indicating acceptable model fit
RMS Theta	<0.12	0.043	Indicating acceptable model fit

TABLE 7. VIF value.

Collinearity Between	Value	Criteria	Decision
CI → OI	1,219	<0.5	There is no collinearity
FIN → OI	1,140		There is no collinearity
KMS → OI	1,226		There is no collinearity
Moderating Effect → OI	1,150		There is no collinearity
(ME) FIN → OI			There is no collinearity
ME_KMS → OI	1,418		There is no collinearity
ME_N → OI	2,018		There is no collinearity
ME_OC → OI	1,461		There is no collinearity
ME_ST → OI	1,529		There is no collinearity
N → OI	1,425		There is no collinearity
OC → OI	1,262		There is no collinearity
OI → IOI	1,000		There is no collinearity
ST → OI	1,205		There is no collinearity

management system (KMS), and organizational culture (OC). In previous research, the exploration of factors that can support closed innovation towards open innovation is based on literature studies and qualitative excavations [19], [20].

Organizations need to integrate and manage knowledge from external sources with the organization's knowledge management system to achieve optimal open innovation [41], [42]. The role of knowledge management systems is important for organizations in the transition process from closed innovation to open innovation because it can assist in knowledge management, which was initially only based on internal organizations but developed into interactions between organizations [20]. In closed innovation, the organization focuses on protecting knowledge and skills which are sources of excellence and contribute to value creation, while through open innovation, organizations need to share and exchange knowledge, resources, and skills between organizations.

The change from closed innovation to open innovation requires a balance of access to knowledge that comes from external and internal organizations [19]. The findings obtained from the study also show that the knowledge management system variable can strengthen the effect of closed innovation to open innovation. The practice of implementing closed innovation that has been carried out so far, if it is strengthened by the application of a knowledge management system, can support the success of implementing open innovation practices in Batik SMEs. It is hoped that MSME actors can increase their competitiveness and degree of innovation through the success of open innovation.

One of the main problems faced by related SMEs is limited access to financial resources and financial management for working capital planning [43]. Financial factors in SMEs are highly considered for decision-making in terms of investment, human resource management, and important financing for organizations [20], [44]. Financial limitations can make it difficult for SMEs to implement open innovation because the costs of open innovation projects are relatively high for access to knowledge and technology [20]. Access to financial resources to fund open innovation projects is one of the

critical success factors for open innovation projects [45]. The smooth implementation of open innovation in SMEs requires a certain budget allocation in accordance with organizational goals [19]. The findings of the study indicate that financial ability is one of the dominant factors influencing the moderating relationship between closed innovation and open innovation. It can be seen in Figure 4 that SMEs with high finance have advantages in terms of funding and financial management to finance the transition from closed innovation to open innovation. The higher closed innovation ability of SMEs is supported by high financial capabilities, so the SMEs can implement open innovation better than low financial SMEs.
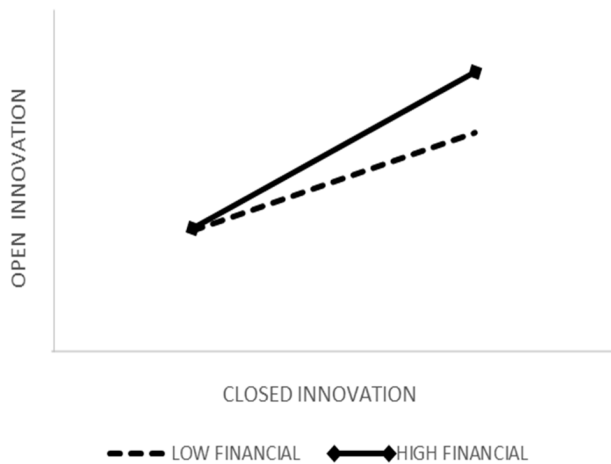
FIGURE 4. Relationship between closed innovation and open innovation based on financial management.

The COVID-19 pandemic has had not only an impact on the health sector but also had an economic downturn. Every organization is faced with a situation of uncertainty, complexity, and ambiguity of environmental conditions. In order to survive and restore organizational conditions, SMEs need to innovate [46]. In addition, it is important for SMEs to adopt digital technology in the face of limitations during the situation of the pandemic. SMEs that have better access to funding digitally experience an increase in total income [47]. During the pandemic, crowdsourcing financial funding was widely available, allowing collaboration between parties and data integration to overcome pandemic problems through the application of open innovation [48], [49]. In line with the research results, SMEs with higher financial.

The capability of open innovation can accelerate the open innovation process. In the COVID-19 pandemic situation, this financial capability needs to be in line with the application of digital technology to make it easier for SMEs to collaborate with various parties, including obtaining funding to be able to survive in difficult situations during and after the pandemic. In the new normal situation, SMEs that are able to get through the difficult period of the pandemic certainly have the initial capital to accelerate the open innovation process that is beneficial for organizational development.

In the process of closed innovation towards open innovation, the role of partners who have available knowledge or skills to be exchanged openly is the determinant of success. There are often many partners involved in the open innovation process, thus forming a formal network that can support each other. When companies do not have a partner who can work together to develop and exploit knowledge, organizations often reapply closed innovation practices to protect competitive advantage [41]. The partnership network owned by SMEs is useful for forming and exchanging knowledge as a provision for open innovation. SMEs need to balance the depth and breadth of partnership networks needed to support organizational development [50]. The existence of partners and the type of partners to collaborate with will determine the practice of open innovation managed by the organization [51].

The application of open innovation relies on managing relationships with external parties, and conflicts are often found due to power imbalances or unequal goals. It is important for SMEs to be able to manage good partnership relationships with various parties to support the implementation of open innovation [51], [52]. Partnership networks are a source for internalizing or externalizing technology, knowledge, and skills needed to develop innovation processes for organizations [20]. The findings from the research results in Figure 5 show that SMEs with high partnerships are able to implement both closed and open innovation and innovation processes better than SMEs with low partnerships. SMEs need to develop skills in establishing partnership networks to optimize the contribution and role of each partner to the organization.
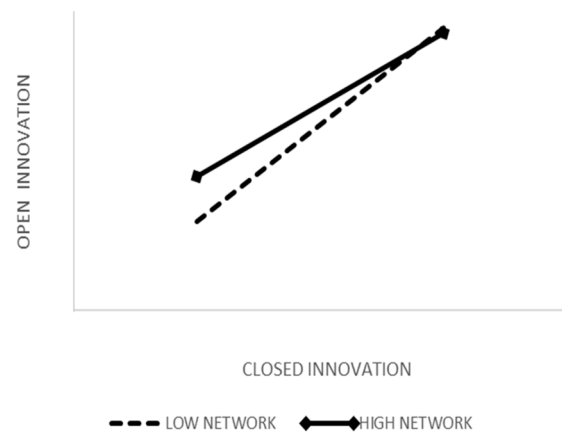

FIGURE 5. Relationship between closed innovation and open innovation based on networking.

During the pandemic, SMEs are faced with limitations in obtaining supplies and a decrease in the number of requests that can affect production capacity. One thing that can be done to survive is to strengthen innovation with the available resources [53], [54]. However, along with the uncertainty of the environmental situation, SMEs need to join a network of strategic partnerships with other companies. Through this

strategic network, SMEs can exploit resources together, carry out continuous innovation and produce new or better products in the market [55]. The availability of partnerships and collaborative tools can accelerate the application of open innovation to overcome the challenges faced during the COVID-19 pandemic [56].

Based on the results of the study, it was found that the implementation of open innovation in the COVID-19 pandemic situation can be carried out in line with the level of the organization's ability to manage the closed innovation process internally. There are several factors that can accelerate the process of open innovation in the context of SMEs during the pandemic, related to financial capabilities, access to networking, knowledge management capabilities, and organizational culture. In a pandemic situation where limitations are the biggest challenge faced by SMEs to survive, SMEs need to manage their innovation capabilities both through closed innovation and open innovation to be able to face these challenges. Therefore, several managerial implications can be formulated for the management of SMEs, the Government, and other related parties to support the sustainability of SMEs.

First, SMEs need to understand the importance of building a network of partnerships with suppliers, distributors, and other partners who support the sustainability of these SMEs. The existence of partners is a means to obtain various sources of innovation that can be used to overcome limitations during a pandemic. Regarding this situation, the Government needs to regulate and provide recommendations for tiered partnerships so that SMEs can collaborate in implementing the innovation process so that the final results obtained provide benefits and long-term sustainability for all parties.

Second, to be able to survive and manage the innovation process, it turns out that sufficient funds are needed. The role of digitization is a crucial aspect from a financial perspective because it opens up opportunities to obtain funding through a crowdfunding scheme for SMEs. However, in order for the funding management process to be more optimal, it is necessary to have a set of criteria and evaluation standards so that the distribution of funds can be carried out in a transparent and fair manner. For the government, it can also pave the way for cooperation with banks and financial institutions to help overcome the financial aspect to accelerate the process of open innovation among SMEs. Of course, this capability still needs to be developed in the post-pandemic new normal situation to be able to maintain the continuity of SMEs as the largest economic actor in the region.

VI. CONCLUSION

This study attempted to identify and analyze the role of stakeholders in the effort to achieve open innovation in SMEs. According to the study conducted, it is found that there are several actions that can be taken by stakeholders to make the transition from close to open innovation more smoothly. Furthermore, detailed explanation regarding the main findings of this study, as well as contributions and future directions are explained below.

A. MAIN FINDINGS
The results of this study showed that closed innovation had a significant effect on the achievement of open innovation. There are four moderating variables that are proven to strengthen the effect of closed innovation on open innovation, including financial ability, networking, knowledge management system, and organizational culture. Financial ability is found to be the most dominant variable that moderates the relationship between close and open innovation. SMEs with high financial capability will be able to fund the transition from closed innovation to open innovation. The higher the closed innovation ability of SMEs supported by high financial capabilities; the better SMEs can implement open innovation than SME with low financial capability. There is one moderating variable that is not proven to be significant, namely technology. Research conducted empirically by involving a sample of batik SMEs can provide an overview of the supporting factors that need to be considered for the application of open innovation in the context of SMEs with low technology. Data collection carried out during the pandemic also provides an overview of the issues faced by SMEs in order to survive. The findings also indicate that the management of moderating variables, such as financial access, and networking capabilities, is crucial to support the implementation of open innovation for SMEs that can overcome challenges during a pandemic.

B. THEORETICAL AND PRACTICAL CONTRIBUTION
Theoretically, this study enriches the literature of transferring from close to open innovation in SMEs. A few studies have been discussed regarding how SMEs can transform from close innovation to open innovation. This study highlighted the role of stakeholder capabilities in the migration process. Our findings found that stakeholder participation especially in the developing knowledge management system initiative, developing a financial strategy for the OI project, making the strategy to enlarge the network, and developing an "openness" culture in SME can make the migration process run smoothly.

Practically, this study helps SMEs in preparing the migration from close to open innovation. The shift from close to open innovation has never been an easy task, especially for SMEs manager. SME managers must learn how to successfully implement open innovation under the resource scarceness such as lack of human capital, financial resources, and know-how [20]. In order to shift from close to open innovation smoothly, this study found four aspects that should be prepared during the journey. The first aspect is SMEs should start to consider the utilization of knowledge management systems in the organization. It is commonly known that SMEs have a high degree of tacit knowledge, and this kind of characteristic will complicate the interaction with external parties. It is because, when SMEs decide to engage

in open innovation practice, they should be able to codify the tacit knowledge to explicit knowledge so external parties can also access the knowledge, and the knowledge management system can facilitate that kind of process. The second aspect is financial capability. In order to accelerate the transition from close to open innovation, financial investment to the project is needed. SMEs managers should develop financial strategies that consist of a financial plan and budget allocated for an open innovation project. The third aspect is SME should start enlarging their network. It is recommended for SMEs to build inter-organizational relationships with universities and research centers. Else, SMEs can consider participating or being a presence at exhibitions, conferences, and competitions. This kind of action is believed can help SMEs in enlarging their network [20]. Lastly, SMEs manager should initiate an open culture during the transition from close to open innovation. The success in open innovation initiative lies in how employees have awareness and acceptance of openness. SMEs manager is expected to be able to develop means that drive employees to find out technologies outside their boundaries and so they become involved into open innovation activities [20]. SMEs can start to collect ideas and needs from customers in the product development process, collect their customer for product testing and gather their feedback, etc.

C. LIMITATION AND FUTURE DIRECTION

This study has some limitations. First, the data obtained in this study is from SMEs in Batik industry, where it is sure limits generalization of SMEs whereas this study tried to talk about SMEs in general. It would be more comprehensive if the data came from diverse types of SMEs to increase its generalization. Second, the data obtained in this study came from three different regions and is assumed to have similar characteristics since this study is considered a preliminary study. It would be more accurate if a multigroup analysis is conducted to check whether different regions have different characteristics that might affect the result of this study or not. Last, stakeholder capabilities involved in this study are mostly the capabilities of internal stakeholders. In fact, there are also capabilities of external stakeholders that can affect the smoothness of the transition from close to open innovation. Further study could also consider the participation of external stakeholders such as government and communities to boost the implementation of open innovation in SMEs.

There are opportunities for further research obtained from the findings in this study. Further research can be directed to examine the characteristics of other SME samples, with the application of digitalization technology being more dominant. This is an interesting issue because in this study the object of research is a batik SMEs with object characteristics including low technology because the process is dominated by traditional activities and focuses on human abilities. This allows the role of technology in moderating the relationship between closed innovation and open innovation not to be proven significant. In the more diverse characteristics of

SMEs, factors that support the success of open innovation can be identified according to contextual issues.

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