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The Role of Process Innovation between Firm-Specific Capabilities and Sustainable Innovation in SMEs: Empirical Evidence from Indonesia

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Received: 27 May 2018; Accepted: 22 June 2018; Published: 29 June 2018



Abstract: The importance of sustainable innovation achievement propels firms to consider the economic, social, and environmental dimensions of sustainable development. However, it is important to clarify that not all innovations impact sustainable development. Regardless of the limited circumstances in small and medium-sized enterprises (SMEs), intrapreneurship, stakeholder integration, and absorptive capacity are firm-specific capabilities that could be explored as strategic intentions of management practices in the organization. This paper investigated the mediating role of process innovation in the relationship among the firm-specific capabilities of absorptive capacity, intrapreneurship, and stakeholder integration for sustainable innovation in SMEs. This empirical study examines the manufacturing sector of Indonesian SMEs with a sample size of 190 firms. The study found that practices of process innovation, as a mediator triggered by the firm-specific capabilities of absorptive capacity, intrapreneurship, and stakeholder integration affect sustainable innovation, although at low stages. Finally, implications for the theory and practice of attaining sustainable innovation in SMEs are drawn.

Keywords: sustainable innovation; firm-specific capabilities; process innovation

1. Introduction

The last two decades have seen a growing trend toward investigating ways to contribute to sustainable innovation through the remanufacturing of sustainable manufacturing or eco-innovation by small and medium-sized enterprises (SMEs) (e.g., [1–3]). This research has shown that SMEs with limited circumstances regarding finances, skills, and experiences are challenged not only to face competitors in the market arena by producing products to satisfy the current demands, but also need to consider the balance regarding the future time required as well as the economic, social, and environmental benefits. On the other hand, sustainable innovation through deploying innovation types as a change method is viewed as a way to follow the efforts being taken to achieving a future of sustainable development [4–7]. However, effective sustainable innovation in SMEs is problematic for several reasons.

First, change as the result of innovation has either positively or negative effects [8–10]; Bos-brouwers [11] argued that all innovations are not certainly impacted by sustainable innovation. Size and region contribute to the progress of sustainable innovation. Compared with large firms, small firms are bounded by a lack of resources that would enable them to invest in technology or human resource capability to anticipate the ecological impact [12–15], or integrate corporate social responsibility (CSR) into a business strategy as a social issue [16,17]. Thus, SMEs generally prefer to adopt a reactive approach to sustainable innovation [18]. Entrepreneurial development in a developing country differs from that in a developed one. The economic status of entrepreneurs in a developing country is associated with an efficiency-driven approach rather than the innovation-driven approach of developed countries [19]. Arising entrepreneurial activity in a developing country is distinctive regarding the opportunities, financial resources, apprenticeship and human resources compared with a developed country [20]. Business motivations for adopting technology is dependent on the institutional bureaucracy degree of central governments, as well as long-term political support, in countries such as China and Nepal [21,22]. Thus, the institutional frameworks of developing countries need to encourage entrepreneurial motivation [23].

Second, appropriate practices in manufacturing sustainability remain unclear, since manufacturing SMEs regard change as optional and expensive [24,25]. Large studies have emphasized the need for radical innovation in the form of fundamental change in order to achieve sustainable innovation; examples include the development of biorefinery systems [26], solar photovoltaic electricity [27], or green practices [28]. This leads to the view that entrepreneurs ought to pursuing change in this stream of creative destruction [3,7], but previous works have doubted the feasibility of this practice due to incongruence resources in SMEs [29,30]. In the manufacturing strategy literature, change is suggested as part of an incremental approach that considers the needs of employees' involvement in a flexible process that forms part of a comprehensive framework within an uncertain environment [31,32]. Industrial experts agree more with value-added creation-oriented innovation rather than core production technology for innovation in SMEs [33,34]. Prior studies have approved the existence of continuous change for sustainability that has mostly been conducted in the large firms of developed countries. Examples include a case study of the United States (US) and European Petrochemical industries [35], and an empirical study of Taiwan's electronics industry [36]. However, a systematic understanding of how the change process contributes to sustainable innovation in SMEs is still lacking.

Despite dealing with barriers in SMEs, flexibility and adaptability are considered ways to undertake innovation [37], alongside reducing bureaucracy, increasing the closeness between owners and customers, developing owner expertise, or streamlining organizational structures [38,39]. Uddin [40] indicated the capability of indigenous knowledge, which has advocated for continuous improvement in small Bangladesh firms. In other words, SMEs have specific capabilities that could be explored as an organizational approach for sustainable innovation; in particular, studies regarding the influence of management practices in the organization are required. Sustainability researchers have largely emphasized the integration of a firm's internal capacity by identifying and exploiting opportunities, the external factors of stakeholders, and a combination of internal and external initiatives [41–48]; however, they have yet to extensively examine the particular sustainable innovation achievements of SMEs.

As a consequence, the objectives of this paper are to determine the mediating role of process innovation between firm-specific capabilities and sustainable innovation, and whether the specific capabilities of SMEs can activate process innovation for sustainable innovation achievement, particularly in developing countries such as Indonesia. Our article offers several contributions. Regarding best practices, firms can differ from each other in the manufacturing sector. While not all changes contribute to sustainability [11], SMEs' industrial activities within developed countries can also contribute to the achievement of sustainable development. Hence, our contribution is to clarify the way that the change process in SMEs affects the social, economic, and environmental dimensions

of sustainable innovation in an integrated way. Subsequently, it does consider the capabilities (internal, external, and combinations thereof) that extend to the capabilities of intrapreneurship, stakeholder integration, and absorptive capacity. These extend to the degree to which the specific capabilities of the firm, as the key features under a dynamic capability approach, can be utilized to support sustainable innovation achievement. Lastly, we identify the importance interdependences of firm-specific capabilities and process innovation, which indicate that firm-specific capabilities may be the catalyst for process innovation for sustainable innovation achievement in SMEs. Completely, these issues have been pointed out as areas ripe for further study in prior works on sustainable innovation [11,49–51].

This paper has the following structure. After this introductory section, the article reviews the relevant literature and illustrates the research hypotheses. This is followed by an outline of the research methodology in the third section. The fourth section presents the results, and we discuss the empirical findings with particular reference to Indonesian SMEs in the manufacturing sector in the fifth section. Finally, a concluding section summarizes the results and outlines theoretical and practical implications. Limitations and suggestions for future research are also addressed in this section.

2. Literature Review

2.1. Sustainable Innovation

In the new global economy, large studies have indicated the importance of sustainable innovation trajectory as a central issue for the survival of firms in the worldwide spread of unlimited business competition [52–55]. From the microeconomic perspective, sustainable innovation attainment is sometimes called eco-innovation or environmental for its ecological dimension (e.g., [56,57]); other terms consider the social dimension (e.g., [58]), environment–social dimensions (e.g., [59]), or environmental–economic dimensions (e.g., [60]) rather than considering sustainability in an integrated manner as people–planet–profit [61] dimensions that are all engaged in innovation activities, which is a must. However, difficulties arise when an attempt is made to implement sustainability in practice. The balancing effort between monetary benefits, environmentally-friendly benefits, and dimensions of human well-being in sustainable development, alongside the increasing market demands of providing value-added creation of innovation to increase consumer satisfaction, involves lots natural resource exploration and intensive pollution.

For global sustainable consumption and production, a large and growing body of literature has suggested radical technological change in the form of national innovation systems [62,63] or global innovational networks [64] as a way of facilitating international information exchange and collaboration rather than relying on self-governance [65,66]. Nevertheless, this approach has only been applied in countries that already have instrumentation for financing science, creation, and human capital. Meanwhile, others do not [67], such as the Republic of Croatia [68] and Thailand [69], for example.

By focusing on developing countries with businesses dominated by small and medium-sized firms (SMEs) with less successful technology, continuous debate about the best strategies for sustainable innovation achievement within global goals can be achieved only if developing countries are also participating. Some studies have underlined the importance of an intermediary in the creation of a network to force an innovation system [70–72]. However, some scholars doubt whether a developing system's ability to innovate would be any different from the developed one, which is characterized by a learning mechanism and the relations of different actors and flexibility in the organizational structure [65,73,74].

On the management side, behavioral approach and knowledge movement are the keys to figure out before examining the situation from a macro perspective [75,76]. In addition, although small firms may lack economic development, technology, and knowledge-intensive procedures, they may capitalize on the learning and innovation formed by a small-firm owner's perception [77]. However,

far too little attention has been paid in this area, particularly in less developed countries [78]. A much more systematic study could better identify how firm ability and innovation interact, which are believed to be linked to sustainable innovation.

2.2. Firm-specific Capabilities

Over the last 20 years in strategic management, the resource base has been viewed as continuous adaption through firms' abilities (e.g., [79–81]) rather than looking at resource utilization within activities as a static concern (e.g., [82–85]). This resonates in the context of sustainable innovation; achievements that consider environmental integration require more existing competencies, resources, processes, and infrastructures to improve the ecological benefits, social impacts, and economic values. Moreover, in the manufacturing industry, process innovation within a wide range of activities is determined by changing the technology, work processes, or behavioral routines of the organization. For instance, change processes are associated with either total quality management (TQM) and environmental management such as ISO 14000, ISO 14001, and ISO 9000 systems, or TQM [86–90] as advanced manufacturing practices supported by circumstances of top management commitment, setup, and financial and system benefit awareness. The latter are dominantly carried out within large firms, which are unlike small firms regarding their internal flexibility, external reconfiguration, and integration capabilities as promising capabilities for innovative strategies, as well as learning network capability and resource acquisition, which enable capturing and exploiting opportunities [91].

Large studies that have been focused on small firms suggest stimulating internal initiatives (e.g., a firm's characteristics and conditions, competency, entrepreneurial vision, and goal orientation) [47,51], external factors associated with the company's efforts to implement sustainable innovation that may affect and/or are affected by corporate activities (e.g., suppliers, consumers, and competitors) [50,92], or a combination between internal and external initiatives (e.g., [4,41–48]) that are richly covered by a broad scope of abilities and knowledge in a firm. This study combines the seminal theory of dynamic capability of Eisenhardt and Martin [93] and Teece et al. [94], since identifying the effort of the resource dimension is needed. At the same time, combining resources and activities into routines for sustainable innovation achievement particularly relates to the integration of internal and external capacity and the combination of internal and external initiatives following the cognition that developing capabilities cannot be viewed independently, but instead are sequential interdependencies [95–98].

The dynamic capability approach is popular within established firms, but it can also be applied in SMEs due to the business environment faced by SMEs encouraging them to grow their capabilities in order to survive. These can include searching for opportunities, motivating employees, or managing transformation [99–102]. Hence, the firm-specific capability is viewed as a driver of sustainable innovation, and is defined as a firm's ability to create value through a set of resources by matching the changing needs of the environment and gaining future opportunities through cognition and action that is context-specific, dynamic, relational, and humanistic to the particular organizational routines of a firm. A development of this view follows:

First, the development of new and improved products or processes based on internal routines and practices promotes intrapreneurship through specific values in pursuing opportunities [103]. Kuratko and Morris [104] emphasized that dynamic creation needs to be integrated into corporate entrepreneurship in which decisions of resource allocation are organized by managers to capture the future business environment and emphasize the importance of routines and habits for new processes and operating methods. In other words, the combination of a Schumpeterian perception, which includes introducing novelty and seeking opportunity, with an evolutionary perception that promotes and shapes learning endeavors covered within dynamic capability, would enable either an intrapreneur or entrepreneur to seize the coherence of new opportunity and a firm's resources. Kyläheiko et al. [105] viewed firm-specific capabilities from the perspective of entrepreneurial motives, and encouraged exploiting new opportunities by utilizing resources based on existing capabilities. Antoncic and Hisrich [75] proved the relationship between intrapreneurship role and the growth and

profitability of firm performance. Thus, intrapreneurship in SMEs has been believed by some studies as a way to revitalize, reconfigure, and transform resources for the emergence of the dynamic business environment rather than entrepreneurship at the individual level (e.g., [106–108]).

Second, there are outside factors that influence firm development. In this study, an outside factor is perceived as stakeholder orientation, which has a different set of expectations, and neglecting stakeholder expectations may create conflict within the firm [109]. Hence, the ability to integrate stakeholders' expected value into the firm is viewed as representative of the dynamic capability approach. Plaza-Úbeda et al. [110] explicated that integrating stakeholders' interests as part of the strategic capability of a firm by coordinating and integrating intangible assets (e.g., knowledge) makes it difficult for these assets to be imitated. This capability achievement of a firm leads to distinct managerial and organizational processes of firm-specific capability that reflect dynamic capabilities by utilizing knowledge and learning [49,111]. Some studies have supported this shape through integrating stakeholders' interests into a set of practices that are linked to organizational activities (e.g., organizational learning) [112]. Black and Härtel [113] developed and tested a model of process integration with stakeholder engagement, and found that social responsiveness has risen from a firm's social responsibility orientation.

Last, internal and external factors influence innovativeness [114]. Internal factors stem from the firm's environment, such as suppliers, buyers, and knowledge spillovers, and other factors available from inside a firm, such as for instance, the skill and experience accumulation of workforces [115,116]. The dynamic capability approach refers to combining co-specialized assets and capturing value from creative and routine operations of a firm; this leads to various knowledge-related constructs that have moved into knowledge sharing, integration, and creation at the organizational level [117]. In other words, dynamic capability is not only a matter of capability regarding managing resources or processes, but also changing routines and processes [118]. Foss [76] terms this knowledge capability as absorptive capacity. Wang and Ahmed [119] confirmed this by highlighting the role of absorptive capacity as a combination of external knowledge and absorbing knowledge for internal use.

A large number of scholars have attempted to link the know-how within firm characteristics, but fail to explain the linkages in a coherent way [120]. This study extends the organizational capabilities under dynamic capability as firm-specific capabilities into intrapreneurship, stakeholder integration, and absorptive capacity.

In innovation management, the constructs are presented within a socio-technical approach that combines people and technology for the specified purpose of innovation within the organization. People represent the socio approach, which includes the capabilities regarding an organization's internal initiative, external linkages, and transformational capacity underpinned by dynamic capability as a driver. Then, in the direction of change, innovation management converts this within the process of innovation as a technical approach to attain the desired performance of sustainable innovation. The change process envisions best practices regarding process innovation in the manufacturing industry. However, the general practices of each firm are not the same, and one practice may succeed in a firm, but not in others. Thus, this study is looking for practices that can be generalized to others, particularly in SMEs, and the practices of Ponsignon et al. [121] are utilized as being effective for other firms. To enable these practices for the desired result, a driver is needed within an organization that can be relied on to activate and deploy resources within the capacity of the firm [122,123]. This merger action is aligned with the economic shocks and assets reallocation of managers, which emerge from technological change as a competitive mechanism [124].

Sustainable innovation is a distinguished concept that lies between innovation and innovation effect, and focuses on the triple bottom line process innovation types in the SMEs of the manufacturing industry. The conceptual framework of sustainable innovation needs to be illuminated. From the evolutionary perspective, sustainable innovation combines the dual theory of dynamic capability and best practices as a 'body of understanding' in the firm-specific capabilities toward a 'body of practice' in the process improvement of process innovation, which Cohendet and Llerena [125] and

Nelson [124] explain as a body linkage under the socio-economic approach for attaining sustainable innovation (Figure 1). This is another approach for sustainability improvement within industries and organizations, besides the utilization of formal decision-making methods [126–128].

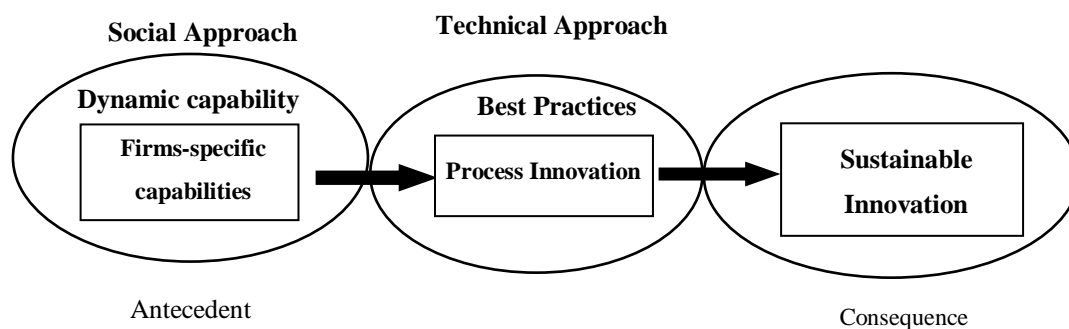


Figure 1. Theoretical Framework of Sustainable Innovation.

2.3. Hypotheses

Process innovation includes the modification of tools or equipment, and requires the ability to transform knowledge into skill across the entire process. The role of understanding knowledge to generate capabilities in routines as Cohen and Levinthal [129] exhibited into acquisition, assimilation, transformation, and exploitation, is formed within absorptive capacity. Gray [130] indicated that absorptive capacity has a strong relationship with innovation regarding the existence of informal and experiential learning activities in SMEs. In the dynamic business environment, this resonates with some studies such as Chen et al. [36] and Kostopoulos et al. [131], who found a significant positive association between absorptive capacity and innovation due to the capability of the absorptive capacity of a firm to identify, acquire, and assimilate external knowledge and process it with existing knowledge to internalize and exploit it for innovation benefit. In other words, process innovation is determined by previous investment in knowledge that is either internal or external, and involves choosing the technical activity to exploit opportunities [132]. This is possible due to knowledge, which is an essential factor for sustainable manufacturing systems and problem-solving, and thus for encouraging improvement. Hence:

Hypothesis 1a. *Absorptive capacity has a positive relationship with process innovation.*

McFadzean et al. [133] exhibited the missing link of this relationship through the holistic view of previous works of literature that defined intrapreneurship as the individual internalization of entrepreneurial activity stimulus, and innovation as the effort of development with multi-stage processes. This is aligned with Miller and Friesen [134], who argued that resource availability and capability are basically the same in the firms, except for being differentiated by the existence of innovation. Industries require the specific capabilities of such individual entrepreneurs in the organization that may activate innovation. This has confirmed by some studies, which showed that organizational innovation and performance are directly influenced by intrapreneurship [135,136]. Madhoushi et al. [137] empirically found that in organizational behavior and culture, the shape of process and product innovation is caused by the reinforcement and facilitation of ideas within a proper climate of creation. Fostering new ideas and creativity affects the entrepreneurial behavior of a manager's mindset; this in turn may increase the values and attitudes of an entrepreneurial organization's culture, which Shepherd et al. [138] called the entrepreneurial spiral. Therefore:

Hypothesis 1b. *Intrapreneurship has the positive relationship with process innovation.*

Product and process development such as signing a standalone contract between the principal (customer) and agent (producer) is determined by technology integration [139,140], configuring systems (Davies et al. [141]), and project changes (Kultti and Takalo [142]) due to constant interaction and engagement with each other. This was illuminated by Zhang et al. [143] in a case study of British industries using qualitative data analysis to focus on stages or processes that were specific to the activity level of stakeholder interaction in the process of project development and implementation, which lead to idea generation and effective and efficient process development. This finding was aligned with Holmes and Smart's [144] case study of non-profit and corporate organizations, in which the dyadic engagement activities of interorganizational collaborations contributed innovation opportunities facilitated by a search and exploration of idea exchange.

Hypothesis 1c. *Stakeholder integration has a positive relationship with process innovation.*

A few researchers have explicitly delineated the relationship between process innovation and sustainable innovation [145,146]. Bos-brouwers [11] explored the innovation process associated with sustainable development within SMEs, which is perceived as “part of a step-by-step process of incremental innovation” rather than radical. This resonates with Foster and Green's argument that “industrial transformation—dismantling, reducing or re-directing modern industry's environmentally disruptive ‘brown’ products, processes, and systems and replacing them with ‘greener’ alternatives—requires technological innovation” [147]. Meanwhile, Sagar [148] considered technology innovation to be process improvement or technology development into widespread use.

Regarding economic scale and the environment, Porter and van der Linde [149] supported improved capacity and continual innovation as the basis of competitiveness, regardless of the cheapest inputs or largest scales. They viewed that innovation can be sparked by the environmental standard, which compensates for the cost, and termed it “innovation offset”. It is not only lowering the net cost to match the environmental regulation, it also leads to the firm's absolute advantages in moving the step forward over the competitors who neglect the regulations. Nidumolu, Prahalad, and Rangaswami [150] strengthened this opinion that the firms that are already engaged in this sustainability as their goal can afford to exist in the future due to the competitive advantage already gained. For instance, reducing pollution and improving productivity are done at the same time, utilizing the same resources.

On the social side, innovation is a social construct that Bos-brouwers [11] defined as establishing the effectiveness of process innovation; this requires work environment support, such as for example, safety and valuing individual contributions [151,152]. Hence, it conveys significant change, commercially viability, quality improvement, the employment of innovation types, and profitability yield to sustain a firm in the long term [153]. In addition, another contribution that concerns this social side of innovation includes advantages for protection and extension market shares, efficient operational improvement, reputational improvement, and cost reduction [154,155].

Hypothesis 2. *Process innovation has the positive significant impact on sustainable innovation.*

Del Brío and Junquera [156] argued that although “SME peculiarities” include lacking personnel and financial resources, it is also possible to achieve sustainability [157]. In the empirical study of 31 manufacturing SMEs, Williamson et al. [25] revealed that the tension between business performance and considering regulation lead to behavior in which the firm tries to improve the performance by focusing on cost reduction and efficiency, as well as obey the regulations by considering the stakeholders of good practices, which together lead to stakeholder and society attractiveness. This is aligned with Ketata et al. [51], who argued that achieving this stage requires the support of organizational routines and capabilities in processes of experience and learning that are associated with valuable knowledge sources as the absorptive capacity that motivates skilled employees to activate the capacity of a firm. The activation is occurred by an identification function of collecting more information from external environment signals, and then transmitting that information across

the organizational boundary into acquiring, transferring, and assimilating new ideas into concrete action [129]. In addition, participation in sustainability, such as choosing a green strategy, indicates a level of absorptive capacity, since determining types of processes requires the support of absorptive capacity to function processes by assimilating technical knowledge from external sources [156,158]. Therefore, absorptive capacity is more likely to be a predictor of performance through innovation [159].

Hypothesis 3a. *Absorptive capacity has a positive significant impact on sustainable innovation.*

Hypothesis 3d. *Absorptive capacity has a positive relationship with process innovation for sustainable innovation.*

Establishing the innovation of ‘best practices’ as ‘doing what we do better’ and ‘doing different’ by dealing with the capability of sensing and seizing the opportunities as the entrepreneurial effort of individual effort in the organization is required for sustainability [160–162]. This is aligned with Coakes et al. [107], who argued that attaining sustainable innovation by way of change in the organization needs the role of intrapreneurship, and idea development of marketable products is directed by innovation. However, the willingness of individuals within the organization to move into sustainable innovation is greatly determined by the legislation of the environmental improvement program and cooling it by adopting a ‘best practices’ techniques [163–165].

Hypothesis 3b. *Intrapreneurship has a positive significant impact on sustainable innovation.*

Hypothesis 3e. *Intrapreneurship influences the process of innovation to have an impact on sustainability.*

The importance of considering stakeholder orientation for sustainable innovation has been emphasized by Cairncross [165] (p. 1005) as “if a firm attempts to differentiate products as ‘green’ or environmentally responsible while continuing to produce high levels of production waste and emissions, it would seem risky because stakeholders (e.g., regulators, environmental groups) could easily expose this anomaly, destroying the firm’s credibility and reputation”. This statement also warns the producers to integrate stakeholders’ expectations within a firm’s production by considering their production related to environmental performance. Hart [166] has implicitly justified the relationship between stakeholder integration, process innovation, and sustainable innovation. This resonates with Ayuso et al. [50], who has captured a direct relationship between internal and external stakeholder engagement and stimulating new ways and approaches to solving problems that contribute to the sustainable innovation orientation.

Hypothesis 3c. *Stakeholder integration has a positive significant impact on sustainable innovation.*

Hypothesis 3f. *Stakeholder integration influences process innovation and thus has an impact on sustainable innovation.*

According to above discussions, the research framework and hypotheses of this study is presented in the Figure 2.

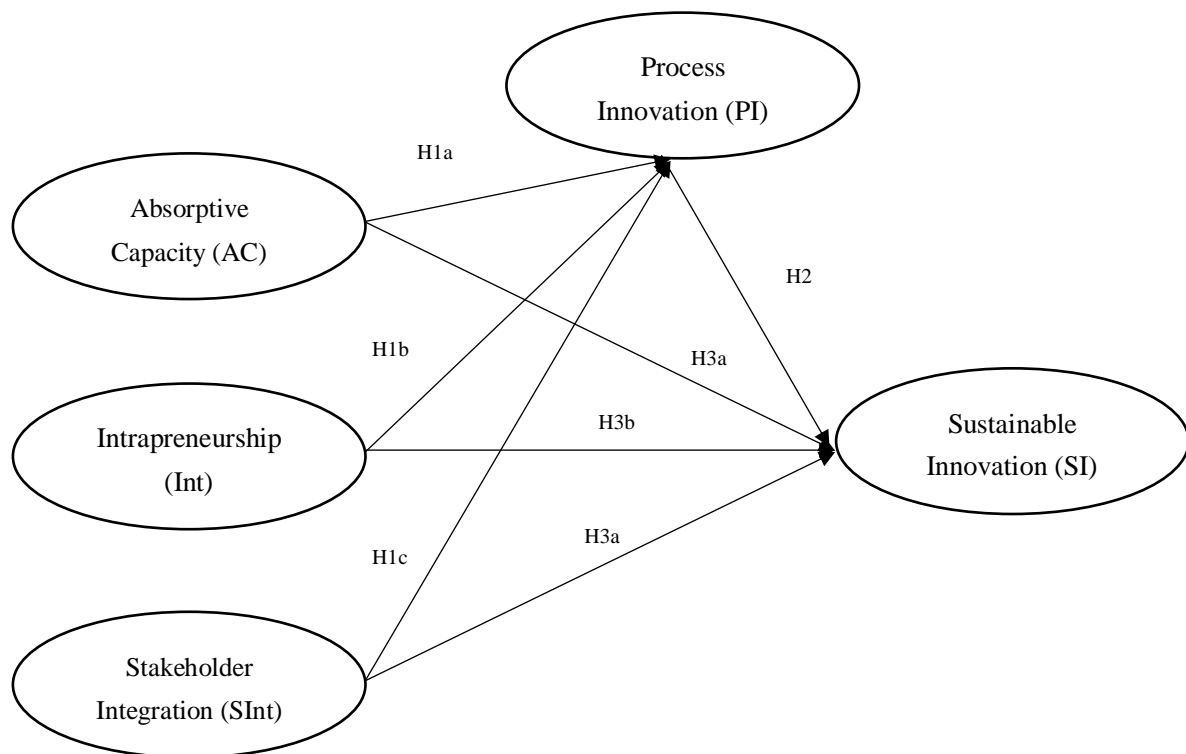


Figure 2. The Research Framework.

3. Research Methodology

3.1. Participants and Procedures

In attempts at sustainable development, the economic dimension is more focused on industrial activities, but it also requires contributions to the environmental and social dimensions. Moreover, achievements in the economic dimension are more viewed in macroeconomic terms rather than seeing the economic benefit of environmental protection activities, as emphasized by Porter and van der Linde [149]. In production activities, Indonesian SMEs are struggling with limited internal infrastructure (e.g., money, managerial skill, information) and low-level external institutional support (e.g., universities, private, public research) [167,168]. These pictures are resonating with Indonesia's rank in the global innovation index 2017 at 87 [169] and in the global competitiveness report 2017–2018 at 36, which was up from 41st in last year's edition [170]. Specifically, the contribution of the South Sulawesi province of eastern Indonesia to the regional gross domestic product (GDP) in 2017 was high compared with the other provinces, with USD 7.3 billion contributed by agriculture, commerce, hotels and restaurants, services, and manufacturing [171]. Still, it has medium national human development index of 69.76, which is lower than the standard national human development index (70–80) [172]. On the contrary, there is evidence that certain capabilities are able to influence SMEs in Indonesia to be more innovative, such as entrepreneurship orientation [173] and absorptive capacity [174].

This empirical study is conducted in South Sulawesi province, Indonesia. We tested our hypotheses using face-to-face interviews with the manager/owner of SMEs, some of whom were initially contacted by phone. The interviews with respondents took 45–60 min on average, but if they could not take place, then we used a survey, which was dropped off and collected. As there are nearly 1000 SMEs in the manufacturing sector of South Sulawesi province according to the data of the Indonesian Statistics Bureau in 2015, we targeted key respondents of 310 manager/owner based on the approach of Bartlett et al. [175]. The key target respondents were chosen because they directly influence the work behavior of employees (Yukl [176]), act as a change agent (Bass [177]),

and have comprehensive knowledge related to the characteristics, strategy, and performance of a firm [178]. Small and medium-sized firms were defined as having five to 99 employees; thus, purposive sampling is used to select the respondents. The list of SMEs was acquired from the Industrial Service and Cooperation and Small and Medium-sized Enterprises of Government Service, and the office of provincial industry in South Sulawesi. The response rate was 61.3%, which is a good response according to Babbie [179], resulting in 220 returned questionnaires, and usable responses from 190 firms.

Table 1 shows the companies that participated in the study and the characteristics of firms regarding the number of employees. The manufacturing firms of this survey that had higher frequencies of response were from the food and drink industry (N = 63), followed by the garment, furniture, and printing industries with the total range number of 25% to 27%. Other types of respondents included those in the homecare, building material, shipbuilding, recycling, and pharmacy industries, which were distributed in the range of 6% to 13%. A total of 190 respondents comprised of small and medium-sized firms were recorded, with 132 categorized as small firms (69.5%), and 58 classified as medium-sized firms (30.5%).

Table 1. Characteristics of Firms.

Types of Firms	Frequency	%
Garment	27	14.2
Shipbuilding	10	5.3
Food and Drink	63	33.1
Furniture	26	13.7
Homecare	13	6.8
Building material	13	6.8
Pharmacy	6	3.2
Printing	25	13.2
Recycling	7	3.7
Total	190	100.0
5–19	132	69.5
Over 20	58	30.5
Total	190	100.0

3.2. Method

The questionnaire consists of two sections. The first section described the constructs of firm-specific capabilities, process innovation, and sustainable innovation with 62 total questions using a five-point Likert Scale (e.g., either 1 = strongly disagree, 3 = neither agree nor disagree, or 5 = strongly agree). The second section was the number of employees. Prior validated empirical research was adapted in the study for measurement of the items of proposed constructs. The questionnaire was translated according to the back-translation approach, which involves translating the instruments from English to the Indonesian language, and then translating it back into English [180]. To ensure accuracy, measurements were examined through face validity and content validity. The analysis was performed based on the data collected through the survey by using SmartPLS 2.0 due to the possibility of cause-and-effect relationships in the complex model [181,182], and small sample sizes [183]. Moreover, the results of partial least square structural equation modeling Partial Least Squares Structural Equation Modelling (PLS-SEM) are an attempt to maximize the endogenous latent variables' explained variance rather than minimize the discrepancy between the estimated and covariance matrices in CB-SEM [184].

3.2.1. Firm-specific Capability

An independent variable of firm-specific capability includes three fundamental constructs. (1) Intrapreneurship was measured via the 15-item scale as the ability to capture and exploit opportunities by creating and improving resources in the concerted action of routines in the organization. It was comprised of proactiveness (five items), risk-taking (five items), and autonomy (five items),

following the previous literature of Lumpkin & Dess [135], Venkatraman [185], Covin & Slevin [186], Nasution [187] and Lumpkin et al. [188]. (2) Stakeholder integration via a 16-item scale captures the ability to bring stakeholders' expectations into the firm as being better than the firm's view of the stakeholders; it covers knowledge of stakeholder (five items), stakeholder interaction (six items), and behaviors of adaptation (five items), as developed by Plaza-Úbeda et al. [110]. (3) Absorptive capacity was measured via a 14-item scale, which represented the potential and ability within firms and the realized absorptive capacity, which consisted of acquisition (three items), assimilation (four items), transformation (four items), and exploitation (three items), as originally developed by Flatten et al. [189].

3.2.2. Process Innovation

Process innovation as a mediating variable was measured by four items that were adapted from Ponsignon et al. [121] to capture the changing of manufacturing practices or determine whether SMEs conduct process innovation by changing as an inherent added value that is not new in the industry, but new in the firm regarding the improvement of the operational process.

3.2.3. Sustainable Innovation

A dependent variable of sustainable innovation was measured by a 13-item scale to capture the impact of innovation integrally within the performance of sustainable economic (three items), environmental (five items), and social (five items) development goals in SMEs, as adapted from Ponsignon et al. [121] and Zhu and Sarkis [190].

4. Results

To assess the research model, our study utilized Smart PLS 2.0 as the partial least square structural equation modeling (PLS-SEM). PLS-SEM under the variance-based ordinary least square (OLS) procedure of Hair et al. [185] predicts the relationship between process innovation and sustainable innovation that is activated by a firm-specific capability. To predict the accuracy of the model, PLS is provided with a bootstrap where each sample from the original dataset is replaced until the number of cases is identical to the original sample set. Therefore, a normal distribution of data is not required for the PLS approach, due to the performance of bootstrapping (Chin [191]), Goodhue et al. [192] proved that PLS at a small sample size has a strong efficacious technique and a confidence interval of expected power with the significance testing of the sample below 150 compared with other analysis approaches, such as regression or LISREL program application, and no global goodness-of-fit criterion is needed to evaluate the overall model [193]. At the same time, this application also has the benefit of high-efficiency parameter estimation through statistical power due to the ability to depict the significance of specific relationships that may be significant in the population. This statistical power has the advantage of PLS-SEM compared with the covariance-based SEM (CB-SEM) approach [184]. PLS assess the research model in the two ways: a measurement model, and a structural model.

4.1. Assessment of Measurement Model

Reflective indicators are measured by internal consistency, reliability, and validity. The reliability value among items within a construct is shown in Cronbach's alpha, and composite reliability should be above the critical threshold of 0.7, as shown in Table 2. Validity is assessed in convergent validity by the value of average variance extracted (AVE) and discriminant validity by examining constructs values of Fornell–Larcker criterion and cross-loadings. The validity study of data analysis yields an AVE of constructs above 0.5, and the Fornell–Larcker criterion of the diagonal value resulted from the square root of AVE is higher than the shared variance of other constructs' value. The cross-loadings results in Table 3 demonstrated that the indicator's outer loadings on a construct are higher than all of its cross-loadings with other constructs. These show that the distinction of a construct with other constructs in its items has accomplished the rule of thumb of the validity measurement model [184,193].

Table 2. Convergent Validity, Reliability, and Discriminant Validity of Fornell–Larcker criterion. AVE: average variance extracted.

Constructs	Number of Initial Item	AVE	Composite Reliability	Cronbach Alpha	Correlation between Constructs					Number of Final Item	
					1	2	3	4	5		
1. AC	14	0.73	0.91	0.9	0.85						4
2. Int	15	0.57	0.86	0.8	0.61	0.75					5
3. SInt	16	0.51	0.83	0.8	0.55	0.54	0.71				5
4. PI	4	0.75	0.85	0.7	0.68	0.70	0.70	0.87			2
5. SI	13	0.59	0.88	0.8	0.70	0.53	0.50	0.73	0.77		6

Table 3. Cross-loading of Validity Measurement.

	AC	Int	SInt	PI	SI
AC1	0.9381	0.6263	0.5669	0.6739	0.6728
AC10	0.8121	0.3827	0.3286	0.4336	0.4242
AC6	0.6937	0.3480	0.3615	0.4602	0.3838
AC8	0.9416	0.6294	0.5510	0.6805	0.6304
Int12	0.6340	0.9313	0.5412	0.7246	0.5417
Int2	0.6159	0.9474	0.5578	0.6856	0.5497
Int4	0.1933	0.4968	0.2612	0.2529	0.1354
Int6	0.2862	0.5589	0.2387	0.3244	0.2762
Int7	0.3446	0.7182	0.2934	0.4298	0.2889
SInt1	0.2092	0.1384	0.5969	0.3038	0.1857
SInt10	0.2706	0.2439	0.7048	0.3152	0.2778
SInt13	0.2765	0.2690	0.5686	0.2910	0.2146
SInt14	0.4490	0.3788	0.7953	0.5016	0.3662
SInt15	0.5667	0.6328	0.8526	0.7929	0.5428
PI1	0.6423	0.6783	0.7566	0.8786	0.5585
PI3	0.5294	0.5258	0.4473	0.8568	0.7170
SI10	0.5483	0.4536	0.4272	0.5416	0.8402
SI12	0.5570	0.5301	0.4637	0.7791	0.7947
SI13	0.3906	0.2529	0.2478	0.4741	0.6344
SI8	0.5385	0.4562	0.4439	0.5240	0.8560
SI9	0.3518	0.2103	0.2460	0.3388	0.6750

4.2. Assessment of Structural Model

The structural model or inner model is evaluated by generating data and drawing the conclusion using the PLS-SEM algorithm and the bootstrapping procedure of repeated processes for about 5000 random sub-samples in Smart PLS 3.0 in order to estimate a new sample. Table 4 demonstrates the algorithm results of beta values, the standard error, and the bootstrapping value of distribution using Student's *t*-test and effect size (*f*²). The effect size calculates the impact of a specific exogenous construct on endogenous construct with an assessed value of 0.02 (small), 0.15 (medium), and 0.35 (large) [184,194].

The direct effects of three hypotheses (H1a, H1b, and H1c) were developed to determine the role of firm-specific capability in activating process innovation. The results, as shown in Table 4, showed positive and significant effects after bootstrapping at *t*-values above 2.57 ($p < 0.01$) as expressed by values of 4.631, 4.853, and 4.447, respectively. Further, the effect size (*f*²) value of absorptive capacity has the smallest effect on process innovation, followed by intrapreneurship and stakeholder integration as the largest effects.

Table 4. Result Correlations between Firm-Specific Capability and Process Innovation.

Hypothesis	Relation	Std. Beta (β)	Standard Error	t-Value (Bootstrap)	Effect Size (f^2)	Decision
H1a	AC \rightarrow PI	0.272	0.058	4.631 ***	0.127	Supported
H1b	Int \rightarrow PI	0.331	0.068	4.853 ***	0.194	Supported
H1c	SInt \rightarrow PI	0.372	0.061	4.447 ***	0.283	Supported
H2	PI \rightarrow SI	0.607	0.099	6.100 ***		Supported

*** $p < 0.01$. AC = Absorptive Capacity; Int = Intrapreneurship; SInt = Stakeholder Integration; SI = Sustainable Innovation.

Testing the Mediating Effect of Process Innovation

The mediating analysis of process innovation was conducted within two steps. First, the direct effect of the firm-specific capabilities of absorptive capacity, intrapreneurship, and stakeholder integration on sustainable innovation was examined. Subsequently, the indirect effect of the mediating construct was tested by applying the “bootstrapping the indirect effect” method of Preacher and Hayes [195,196], which is presented in the full structural model.

Direct effect without mediation as a structural model 1 is presented in Figure 3 and Table 5. Before the assessment, a collinearity test of variance inflation factor (VIF) was tested to check the model quality and assess whether the predictors had collinearity on endogenous constructs with a tolerance level lower than five [184]. The (unreported) VIFs of the predictors were below five, indicating the absence of collinearity. Further, the values of R2 and Q2 were examined to ascertain the predictive accuracy of the model. The threshold of the R2 value ranged from 0 to 1, which indicated that a higher level of predictive accuracy could be respectively described as 0.75 (substantial), 0.50 (moderate), and 0.25 (weak) for endogenous latent variables [193,197]. The Q2 value was measured by applying the cross-validated redundancy of the blindfolding option in PLS-SEM, in which the measurement value was categorized as 0.02 (small), 0.15 (medium), and 0.35 (large) with the predictive relevance for a selected endogenous construct [184,193]. The R2 and Q2 values of structural model 1 showed the predictive accuracy of the endogenous construct of sustainable innovation at the moderate stage. The path analysis indicates that the direct effect on sustainable innovation from an absorptive capacity had a positive effect ($p < 0.01$). Similarly, stakeholder integration exhibited a positive effect ($p < 0.01$), except for intrapreneurship, which had a statistically non-significant result ($\beta = 0.148, p < 0.10$).

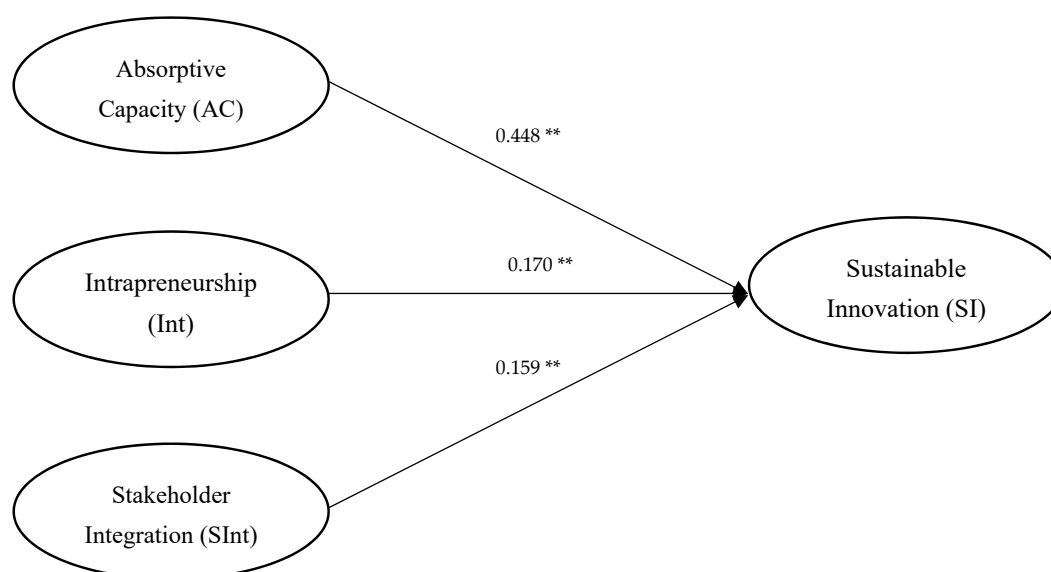


Figure 3. Structural Model 1 of Firm-Specific Capability of Sustainable Innovation. * $p < 0.10$, ** $p < 0.05$.

Table 5. Assessment of Structural Model 1.

Endogenous Construct	R2	Q2		
SI	0.454	0.264		
Relation	Std. Beta (β)	Standard Error	t-Value (bootstrap)	Decision
H3a. AC \rightarrow SI	0.448	0.071	5.423 ***	Supported
H3b. Int \rightarrow SI	0.170	0.073	1.806 *	Supported
H3c. SInt \rightarrow SI	0.159	0.067	2.037 **	Supported

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Next, the full structural model 2 was measured for process innovation (see Figure 4 and Table 6). The R2 and Q2 values of process innovation showed a substantial level in the predictive relevance model, and had a stronger predictive relevance than sustainable innovation. In addition, the (unreported) VIFs were below five for all of the exogenous constructs. The path relations of all three indirect effects showed positive effects for absorptive capacitive, intrapreneurship, and stakeholder integration on sustainable innovation mediated by process innovation, which were significant with $\beta = 0.165$, $\beta = 0.201$, and $\beta = 0.226$ ($p < 0.01$) values, respectively. It is important to note that the relationship of absorptive capacity, intrapreneurship, and stakeholder integration on sustainable innovation in steps 1 and 2 yielded different values. Despite intrapreneurship and stakeholder integration significantly changing process innovation, their values changed from non-significant to significant regarding the relationship between intrapreneurship—process innovation. Moreover, process innovation has increased the coefficient of determination (R2) of sustainable innovation. These results indicate that process innovation as a mediating construct may strengthen the effect on sustainable innovation.

To assess the significance of the mediating role, it was presented with its variance accounted for (VAF) [184]. The evidence showed that the relationship between process innovation and absorptive capacity was partially mediated ($20\% \leq VAF \leq 80\%$) while the effects of intrapreneurship and stakeholder integration on sustainable innovation were fully mediated ($VAF \geq 80\%$).

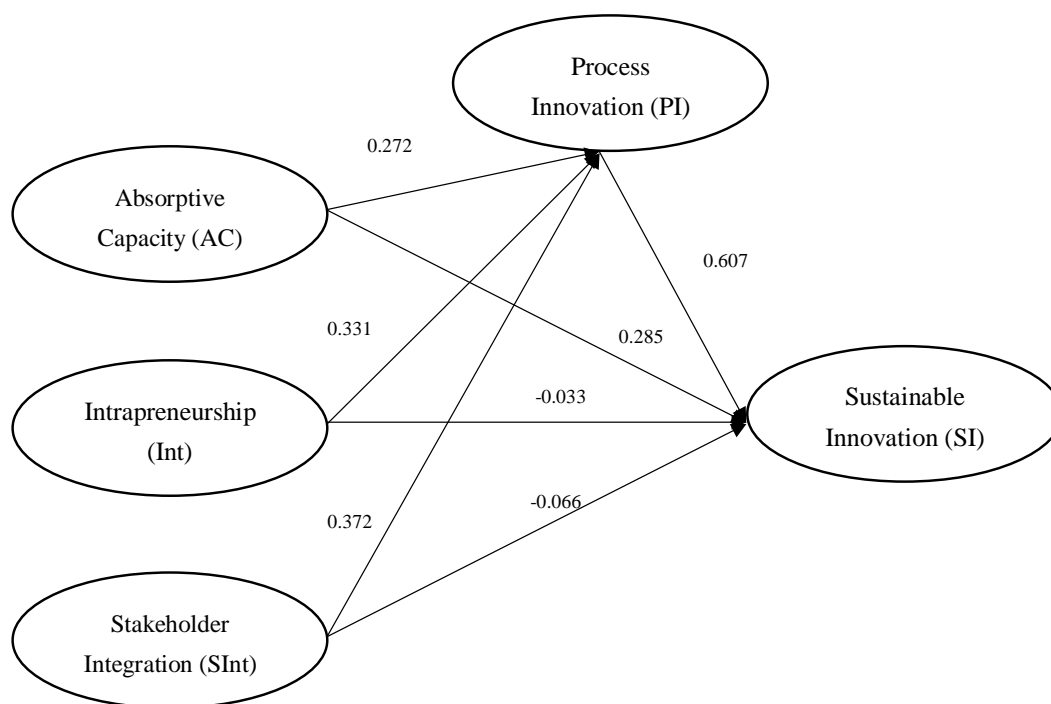


Figure 4. Full Structural Model 2.

Table 6. Assessment of Full Structural Model 2.

Endogenous Construct	R2	Q2			
PI	0.676	0.504			
SI	0.576	0.313			
Relation	Std. Beta (β)	Standard Error	t-Value (Bootstrap)	VAF	Decision
H3d. AC \rightarrow PI \rightarrow SI	0.165	0.041	3.995 ***	36.7%	Supported
H3e. Int \rightarrow PI \rightarrow SI	0.201	0.054	3.672 ***	119.7%	Supported
H3f. SI \rightarrow PI \rightarrow SI	0.226	0.056	4.022 ***	141.3%	Supported

*** $p < 0.01$.

5. Discussion

Finding out the effective way for SMEs to achieve sustainable innovation within incremental change orientation, the present study was designed to determine whether the firm-specific capability of absorptive capacity, intrapreneurship, and stakeholder integration is an enabling factor to activate process innovation. This study also was carried out to investigate whether process innovation has a mediating role in the relationship between firm-specific capability and sustainable innovation, which is tested within Indonesian SMEs.

First, the hypotheses regarding the effects of absorptive capacity, intrapreneurship, and stakeholder integration on process innovation in Indonesian SMEs were examined to ascertain their significance. The results show that the three predictor constructs of firm-specific capability yielded positive impacts on process innovation; thus, hypotheses H1a, H1b, and H1c are accepted. Our result suggests that the dynamic capability approach of three firm-specific capabilities: absorptive capacity as obtaining the external knowledge and ingesting it for internal use by combining internal and external knowledge, stakeholder integration as integrating stakeholder expectation into a firm's operational routine, and intrapreneurship as the way of pursuing opportunities formed by internal routines and individual practices, are enhance the best practices of process innovation. As such, our findings are consistent with the previous studies of process innovation activated by absorptive capacity [174,198,199], intrapreneurship [134,136,173], and stakeholder integration [143,144,146]. An interesting finding was that absorptive capacity has the smallest effect size on process innovation. It may be that a well-developed capability of absorptive capacity is needed to activate the best practices of process innovation, while it is opposite with SMEs, whose capabilities are less documented than the operational firms in the traditional sector [200].

The second hypothesis (H2) proposed that process innovation has a positive impact on sustainable innovation in SMEs. What is surprising is that eliminating non-value-adding tasks and managing exceptions of process innovation not only affects the environmental and social dimensions of sustainable innovation. The study indicates a preference for conventional technology rather than readiness with an automated system for new process development, which resulted in a low sustainable innovation impact in SMEs. This resonates with other studies that have shown that the focus of many firms on sustainability, in particular in Asia, South America, and Australasia, is considered weak (e.g., [25,78,80]). A possible explanation for this might be that firstly, the linkage between the science base and enterprises is weak and caused by a lack of firm's internal resources and institutional support for SMEs [167–169,201]. Secondly, applying sustainable innovation is more accessible for large firms, while it is considered to be optional and require costly practices for a smaller firm, or viewed as a voluntary initiative [25,35]. Thirdly, Indonesian SMEs are more focused on economic activity, and thus on the economic benefits on environmental protection activities. All of this means that sustainable innovation is not yet perceived as an opportunity stage in SMEs. However, the finding is aligned with

Andersén & Kask [202] and Zhang et al. [203], who argued that energy efficiency and the betterment of sustainable innovation are derived from improving the process of process innovation.

The third hypothesis (H3a–H3f) proposed the role of process innovation as a mediator between relationships regarding firm-specific capabilities and sustainable innovation. In order to achieve sustainable innovation, past studies have shown that capabilities are needed and innovation types become more focused. However, it is essential to clarify conclusively the role of incremental change in the process of innovation, and how it affect sustainable innovation in relation to the specific capabilities of SMEs. The model showed that the existence of process innovation has an increased coefficient of determination (R^2) on sustainable innovation, from 0.454 to 0.576. The results show that the best practices of process innovation have a mediating role supported by three firm-specific capability effects: namely, absorptive capacity, intrapreneurship, and stakeholder integration. The study crystalizes several studies that outline a firm innovation's predictors [77,204,205]. This result may be explicated by Keizer et al. [206], who realized that absorptive capacity is possible in SMEs due to higher cognition, but more attention capability is needed to apply the practices of the firm rather than merely relying on the potential absorptive capacity for sustainable innovation achievement. The intrapreneurship of capturing and exploiting opportunity by the willingness of entrepreneurial actor is fully mediated by the incremental change of best practices in process innovation. However, this has not been translated well into sustainable innovation, possibly as explained by Gao and Zhang [207] due to the need for policy encouragement to lead to the preference of pursuing desired performance. Process innovation has a suppressor effect between intrapreneurship and sustainable innovation regarding the way that sustainable innovation attainment requires the change effort supported by idea development and the willingness of individuals in the internal organization to adopt “best practices” techniques [107,164,165,208,209]. The full mediating role of process innovation also existed in the relationship between stakeholder integration and sustainable innovation, because stakeholders' demands such as regulation policy promote the process improvement of process innovation, which in turn improves the sustainability of a firm. It seems possible that this result is due to a two-way dependency relationship of stakeholder demands–organization engagement as determined by the decision-maker in an organization process, which leads to the different level of interest within the network [210]. It is interesting to note that stakeholder integration has the highest significance, although it only affected the social and environmental dimensions of sustainable innovation. Perhaps the cause of this result is that the demands of stakeholders (i.e., end users, suppliers, competitors, or research center) as external factors have a stronger effect within SMEs, since they are more likely to be integrated within the operational organization. This finding further supports the idea of firms' willingness to be connected to and collaborate with stakeholders by developing and modifying their internal organization to provide better individual needs [211–213].

6. Conclusions

This study was designed to evaluate the firm-specific capabilities of absorptive capacity, intrapreneurship, and stakeholder integration toward the existing process improvement of process innovation for the achievement of sustainable innovation in the manufacturing industry of a SMEs' developing country, such as Indonesian SMEs. The results of this investigation show that practices of process innovation can be driven by firm-specific capabilities of absorptive capacity, intrapreneurship, and stakeholder integration.

The study has several theoretical implications in the areas of sustainable development, particularly in the SMEs of a developing country. Theoretically, the study expands upon previous studies, which captured the role of firm-specific internal capability, external capability, and a combination of internal–external capability into intrapreneurship, stakeholder integration, and absorptive capacity to attain sustainable innovation [36,41–48,214]. In this study, the specific capability of the firm is illuminated empirically into intrapreneurship (internal), stakeholder integration (external), and absorptive capacity (internal–external) as the fundamental strategic initiative. To achieve sustainable

innovation, the impact of process innovation is clarified as a mediating role activated by firm-specific capabilities. The study crystallizes the empirical previous study on capabilities of stakeholder orientation by Ayuso et al. [50] and absorptive capacity by Ketata et al. [51] with the mediating effect of process innovation. It also enriches the body of knowledge of best practices of existing process improvements for process innovation for SMEs (Ponsignon et al. [122]). Regarding intrapreneurship is a powerful strategic tool for innovation (Wikstrom [208,209,214,215]); this study categorized and empirically tested firm-specific capability as a part of integrated capabilities to activate process innovation. Hence, in the practical sense, in order to improve sustainable innovation achievement, although such capabilities are currently at a low stage, SMEs are suggested to intensify their internal initiatives regarding intrapreneurship, stakeholder integration, and absorptive capacity in particular, and integrate them with the firm's operation of process innovation.

However, cross-sectional design at a single point of time was utilized in this study; combining this method with qualitative in-depth interviews will be better for further research in order to capture the long-term effects of the capabilities of change processes for sustainable innovation. The study is only focused on the best practices of process innovation; thus, it would be interesting to assess sustainable innovation achievement by considering environmental practices in process innovation. In addition, in future research, it might be possible to use firm-specific capabilities as a set of the complementary asset for firms.

Author Contributions: Investigation, A.W.-H.; Conceptualization, D.S.; Data analysis, A.M. and A.S.; Project Administration, D.S.; Resources, Editing F.C.

Funding: This research received no external funding.

Acknowledgments: The authors would like to thank the Government of South Sulawesi, Politechnic ATI Makassar of Industrial Ministry, and Ministry of Research, Technology and Higher Education of the Republic of Indonesia for supporting this research.

Conflicts of Interest: The authors declare no conflict of interest.

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