

The Indonesia Triple Helix Digital Platform Model in Knowledge Sharing for Product Innovation Collaboration

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ABSTRACT

The research gap between research institutions or universities and industry is still happening today. That arises because there has not been a maximum research collaboration between academic research and industry. This study aimed to develop a triple helix digital platform model in the product innovation ecosystem. Soft Systems Methodology (SSM) was chosen to conduct proposed scientific contributions in knowledge management in the triple helix digital platform model, especially knowledge sharing in product innovation. Data collected through the literature review and interview process with one researchers and two Small and Medium Enterprise (SME) owners, the seven stages of the SSM are used to analyse the results. This research resulted in a conceptual model and a prototype of a digital platform design with a strong foundation for knowledge sharing product innovation in the digital platform ecosystem. This prototype application will support collaboration between researchers and Small and Medium Industries to product innovation.

Keywords: Triple helix platform model; Knowledge sharing; Innovation collaboration; Soft system methodology

1. INTRODUCTION

The growth of innovation will increase the economic productivity and competitiveness of the nation¹⁻². Therefore the industrial sector requires an acceleration in innovation³. The invention has made one of the pillars of innovation a part of the World Economic Forum (WEF).

Based on data from the Global Competitiveness Index (GCI) 2017-2018 WEF, Indonesia's innovation pillar is still lagging behind other countries in Asia. Where Indonesia ranks is 31 with a score of 4, while Malaysia is ranked 22 with a score of 4,7 The pillars of innovation need to be supported by several important things: the quality of research institutions, research funding and university-industry collaboration. This fact pointed by some study that there are limited resources in SMEs innovation⁴ and the need for a conducive climate for collaborative innovation between academia and industry⁵.

The pattern of collaboration between researchers and SMEs is preferred individually to avoid formal structures in organisations so that they will agree individually to receptive and trustworthy people⁶. At the initiation stage in collaboration, the influencing factors are similarities in expertise, ownership of tools, data, and specific knowledge⁷. So the need for an information search platform of researchers is a must to encourage research collaboration⁸.

At present, interactions between individuals have shifted from conventional patterns face-to-face to become virtual⁹. And also the determinants of innovation capability SMEs

obtained from management support, knowledge development and external networks¹⁰. Therefore, a platform for interacting knowledge sharing can be an alternative to bring together researchers and SMEs virtually to build respect and trust.

Therefore, in this study, we raise the research question, "how is the triple helix platform models to become a means of sharing knowledge for research collaboration and product innovation between researchers and the SMEs sector". This study used Soft Systems Methodology (SSM) to identify a knowledge-sharing collaboration model in product innovation combined with a triple helix model. SSM is an approach to detecting problems by looking at real aspects in society¹¹. This method was chosen to illustrate the ecosystem base as a proposed solution to existing problems¹². The final result was expected to produce a prototype of a digital platform with a conceptual and a strong foundation.

Furthermore, The novelty of this study is the knowledge sharing model between researchers and SMEs based on social media digital platforms. There are two new aspects. The first is using a broad context in developing a knowledge-sharing model for innovation, which is based on a literature study¹³. This subject is still limited to the scope of organisations and communities. The second is using the SSM method for knowledge sharing in product innovation combined with the triple helix model.

2. LITERATURE REVIEW

2.1 Triple Helix Model

The Triple helix model was first introduced by Professor

Henry Etzkowitz, who studied the importance of combining three different actors in economic activity to support sustainable regional development (Irawati, 2006). These three actors play an essential role in this model. The university is a centre of excellence. With its ability to conduct research-based education, the industry offers customers commercialisation activities. Government actors function in making policies and regulations for the sustainability of the research and development ecosystem.

There are three conditions for changing the relationship in the Triple Helix model¹⁴. The first condition is a static model where government actors exercise academic and industrial control. The second condition is the laissez-faire model, where the three actors (industry, academic and government) are separated, and few interactions are. They even then occur outside the scope of each actor¹⁴. The third model change is called the triple helix hybrid, where this model makes the university's important role equal to industry and government in a science-based community ecosystem. The relationship between the three is collaborative in which the innovation policy comes from the collaboration of the three actors¹⁵.

2.2 Knowledge Sharing

There are four parts proposed by¹⁶ on the knowledge process: discovery, capture, sharing, and application. Knowledge sharing is an essential part of the knowledge process, which is the key to successful knowledge management¹⁷.

There are many definitions of knowledge sharing. The study conducted¹⁸ compiled several definitions from various literature regarding the meaning of knowledge sharing. From the results of the study, knowledge sharing is a process that aims to disseminate and transfer tacit and explicit knowledge that individuals own to increase knowledge by the recipient or recipient in the form of individuals, groups of individuals, organisations, or communities. Knowledge sharing occurs,

not only in the organisation's scope but also in the broader area^{8-9,19}.

2.3 Social Media as Digital Platform

Social media has become an online platform that facilitates discussions between experts, builds collective intelligence and allows tacit knowledge to be available and easily accessed²⁰. It is in line with the "Ba" concept proposed by Nonaka and Konno (1998) that the existence of cyber "Ba" is a virtual space as a place for sharing and systematic combination of knowledge. This concept is then translated in the initial smart knowledge mapping model as one of the activities that can produce a source of knowledge, namely, virtual activity⁹.

The objectives of this study have been carried out previously. The majority study is 73.3 per cent to explore social media, and only 15 per cent develop based on literature studies²¹. This study is also supported by the results of literature studies¹³ that the majority of 60 per cent researching aspects of behaviour and its nature is very explorative. In comparison, only 12 per cent discusses platforms and tools in social media on knowledge sharing with a small scope, such as organisations and communities.

Based on the description above, conclusions can be drawn regarding state of the art from studies on knowledge

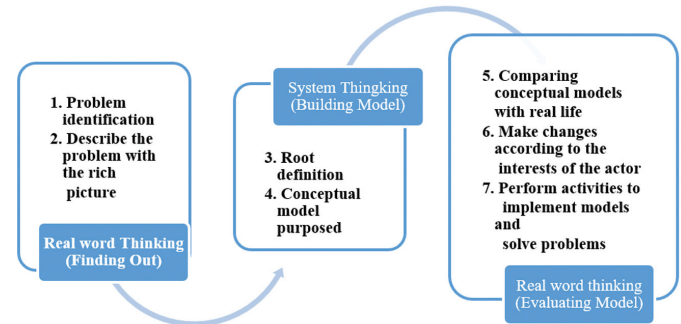


Figure 1. Soft system methodology (SSM).

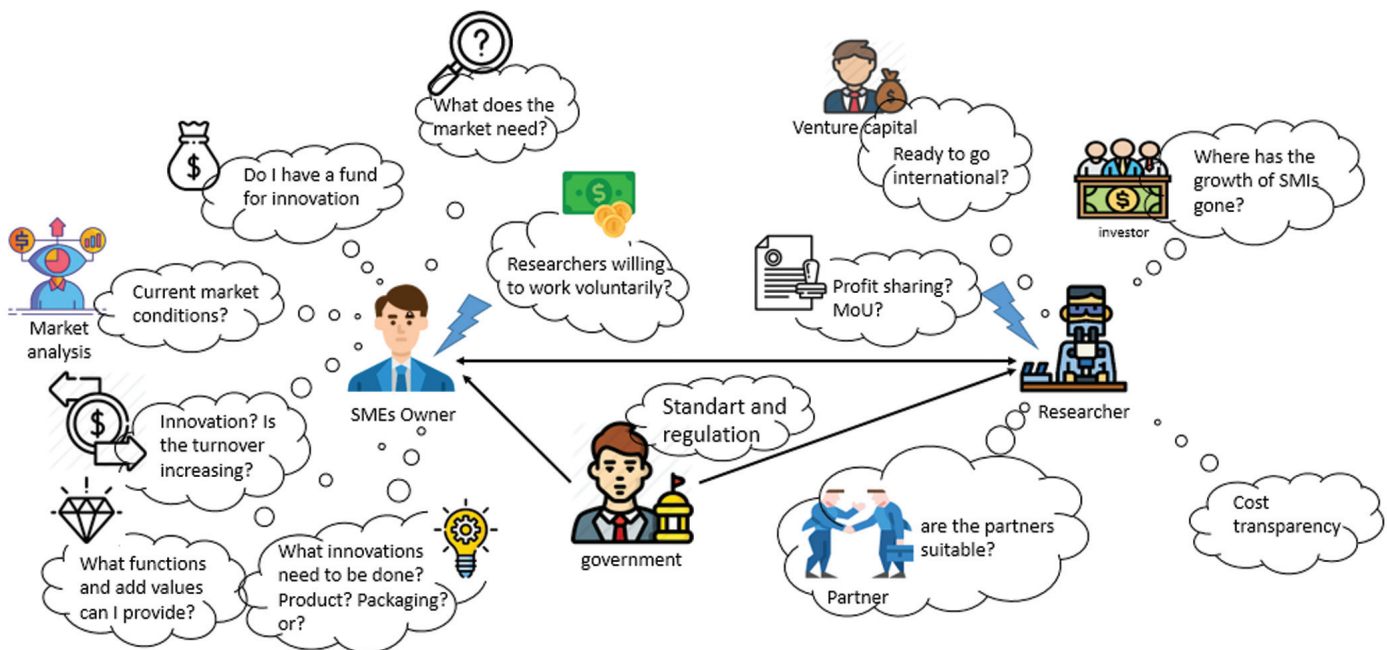


Figure 2. Rich picture.

sharing and social media or digital platforms that there are still opportunities for exportation on aspects of national scope and the development of platforms and tools in the application of knowledge sharing.

By looking at the title raised in this study, the context of this research is national. But the development of the triple helix platform model, which is implemented in this digital era, can be adopted by other countries. So this study proposed scientific contributions in the domain of knowledge management in the form of a triple helix digital platform model, especially knowledge sharing in product innovation.

3. RESEARCH METHODOLOGY

This study was conducted for ten months from July 2020 to May 2021 and was carried out with a qualitative approach using Soft Systems Methodology (SSM)¹¹. It will conduct a literature study related to problem identification and describe it using a rich picture.

Figure 1 depicted all steps in SSM, which were in the first part, stages one and two. Problem identification is carried out through literature studies, through problem finding in Indonesia's context of the triple-helix model. Therefore, the search keywords "triple-helix model" and "Indonesia" were used in the Scopus database to get the appropriate literature. Also, this study interviews a researcher from government institution and two SME, a general manufacturing and trading company that concentrates on coconut shell charcoal processing and another home industry company engaged in cake or snack production to get an overview of the problems faced related to product innovation in SMEs. Furthermore, in the second part, in stages three and four, a root definition analysis is carried out using CATWOE and PQR analysis²². The results are used to create a proposed conceptual model design. In the last part, in stages five, six and seven, the proposed model is evaluated with actual conditions in the field.

4. RESULTS

The authors build a conceptual model based on current real situations through the literature review and interview process with several researchers and SME owners. The conceptual model is built through seven stages in SSM, which will be described in this section.

4.1 Problem Identification

Five articles are used to identify product innovation issues in the triple-helix model. Table 1 shows some specific issues regarding product innovation, namely resource limitation, support for the innovation climate, knowledge transfer and collaboration to produce product innovations under market needs.

Apart from the literature review, this study also identifies the issue of product innovation problems in SMEs through interviews with two small and medium enterprise and one researcher.

SMEs and academics' problems in collaborating on product innovation are similar to the need for time, resources, and funding. However, they have a different perspective on the two entities. SMEs needs to get innovative products that are

Table 1. Product innovation issues in the Triple-helix model from the literature

No	Highlight issues
1.	Resource limitation ⁴
2.	Need comfortable climate Knowledge transfer in cooperation ⁵
3.	Knowledge transfer ²³
4.	It improves facilities and quality research and develops collaboration in a product appropriate to the market needs ²⁴ .
5.	Collaboration ²⁵

fast, cheap and under market needs. On the other hand, it takes a lot of time for academics to research. Besides that, it is also a challenge to make innovative products that are cheap and accepted by the market. In addition, there are also issues of suitability and compatibility in finding and selecting the right partner in collaborating.

4.2 Describe the Problem with the Rich Picture

This rich picture depiction was seen only from the perspective of SMEs and researchers and not from the point of view of other stakeholders.

The stakeholders that appear in the rich picture illustrated below are:

- SMEs actors (owners) are the primary sources in exploring current issues from this research
- A researcher is an academic researcher or an expert who is also the primary source. They could be working in universities or government agencies
- SMEs choose the market, the destination to market their products, can be customers
- An investor is a person who becomes an investor or funder to support new product development
- Venture capital is a stakeholder responsible for assisting in the expansion of SMEs
- The government is the actor that imposes boundaries in regulations for SMEs and researchers.

4.3 Root Definition

The next phase of SSM is the root definition. In making a conceptual model, it is necessary to do a root definition (RD) first. Checkland and Poulter (2006) proposed an approach to doing RD by declaring a *purposeful activity* into six elements, commonly referred to as CATWOE. In addition, it is formulated using the PQR analysis formula to get an idea of what, how, and what it is done.

By compiling CATWOE and QPR analysis as in Table 2 and Table 3, it can be formulated in this study that a root definition as: "A digital platform owned by government and research institution (O), and implemented by the government (A), to modelling triple helix digital platform with ecosystem collaboration in product innovation (P) by linking and matching researcher and SMEs on a digital platform to capture knowledge and profiles (Q) to researchers and SME owners (C) to escalate collaboration in product innovation and the knowledge-base economy ecosystem."

Table 2. CATWOE

Element	Description
Customer	Researcher (Obtaining SME partners and research objects based on field facts), SME Owner (Getting appropriate research partners to solve product innovation problems)
Actor	Government (Implementing a digital platform for a research collaboration ecosystem between researchers and SMEs)
Transformation	The minimal interaction between researchers and IKM in innovation transforms into intensive collaboration on sharing knowledge in creation.
World view	Collaboration is based on applications that can add value and function of a product to the business process at SMEs, utilize information processes, and share knowledge with those in the rich picture by prioritizing trust.
Owner	Government and Research Institution
Environmental	Funding support, Regulation, Compensation for researcher and SME, Copyright, Technology readiness

Table 3. PQR analysis

P/Q/R	Actualisation
P (what it does)	To model the triple helix digital platform with ecosystem collaboration in product innovation.
Q (how it is done)	Link and match researchers and SMEs on a digital platform to capture knowledge and profiles
R (the reason for the activity)	Escalate collaboration in product innovation and the knowledge-based economy ecosystem.

4.4 Conceptual Model Proposed

The conceptual model is based on the root definition results of CATWOE and PQR analysis. Figure 3 reflects the ideal picture of the transformation process that needs to be done in building a research collaboration ecosystem, including:

- The relationship between the sequence of the collaborative research processes in the ecosystem
- Knowledge processes that occur in the ecosystem (knowledge sharing, knowledge capturing and knowledge storing)
- The relationship between actors was involved in the ecosystem based on CATWOE

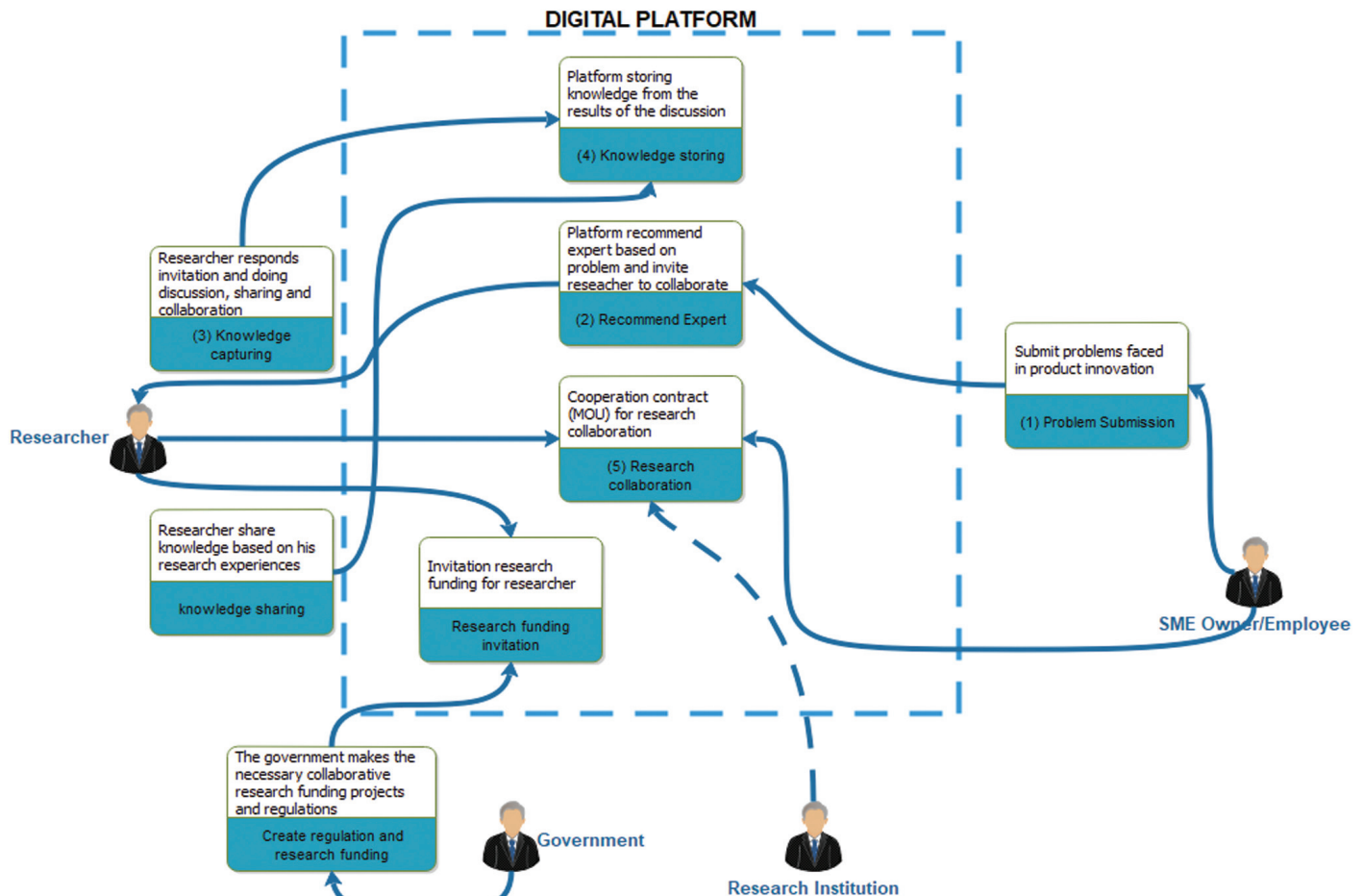


Figure 3. Proposed conceptual model.

6. MAKE CHANGES ACCORDING TO THE INTERESTS OF THE ACTOR

At this stage, the conceptual model that has been built previously will be improved as needed. Changes are made by identifying the actors and activities required to accommodate the gap analysis results in the previous stage in Table 4 as continuation from Annexure I.

Table 4. Addition actors and activities based on gap analysis

Gap in proposed a conceptual model	Changing of model in activities and factors
<ul style="list-style-type: none"> Cooperation to conduct market research Research collaboration with researchers from large industry The knowledge shared is private (knowledge transfer) 	<ul style="list-style-type: none"> Conduct Knowledge Transfer and collaborative product innovation research and market research
<ul style="list-style-type: none"> Actor researchers from large industry Discussion between SMEs Channels of communication with the expert 	<ul style="list-style-type: none"> Additional Actor "Researcher in Industry" Conduct discussion and consultation with the right partner Searching partner information (academic researcher, industry researcher, Consultant and SME)
<ul style="list-style-type: none"> External researchers seek SMEs to partner with 	<ul style="list-style-type: none"> Sharing knowledge and experience
<ul style="list-style-type: none"> Knowledge is shared, which is public 	

In Table 4, two actors, namely consultants and researchers in the industry, are added as parties who are needed and involved in product innovation. In addition, there are also four additional activities to the model: conducting knowledge transfer and collaborative product innovation research and market research, conducting discussion and consultation with the right partner, searching partner informational (academic researcher, industry researcher, Consultant and SME), sharing knowledge and experience. These additions were applied to the proposed model, so the final conceptual model is obtained as in Fig. 4.

7. PERFORM ACTIVITIES TO IMPLEMENT MODELS AND SOLVE PROBLEMS

The conceptual model will help SMEs and researchers better understand their respective roles in this phase. To apply this model, the development application approach by prototyping approach.

From this model, it is necessary to design a knowledge sharing application starting from use-case diagrams as Fig. 5 and Mockup user interfaces as Fig. 6. Then the platform is made based on the design; the results of this development will be tested on potential users. Proposed improvements and errors are followed up by fixing the system. Once it is mature enough to be implemented on the server, the prototype can be accessible. The next stage is socialisation, training and promotion to all stakeholders.

8. DISCUSSION AND IMPLICATIONS

This paper presents a conceptual model that academics and SMEs can collaborate to enhance innovation and become further research from Al-Hakim *et al.*⁸. This additional

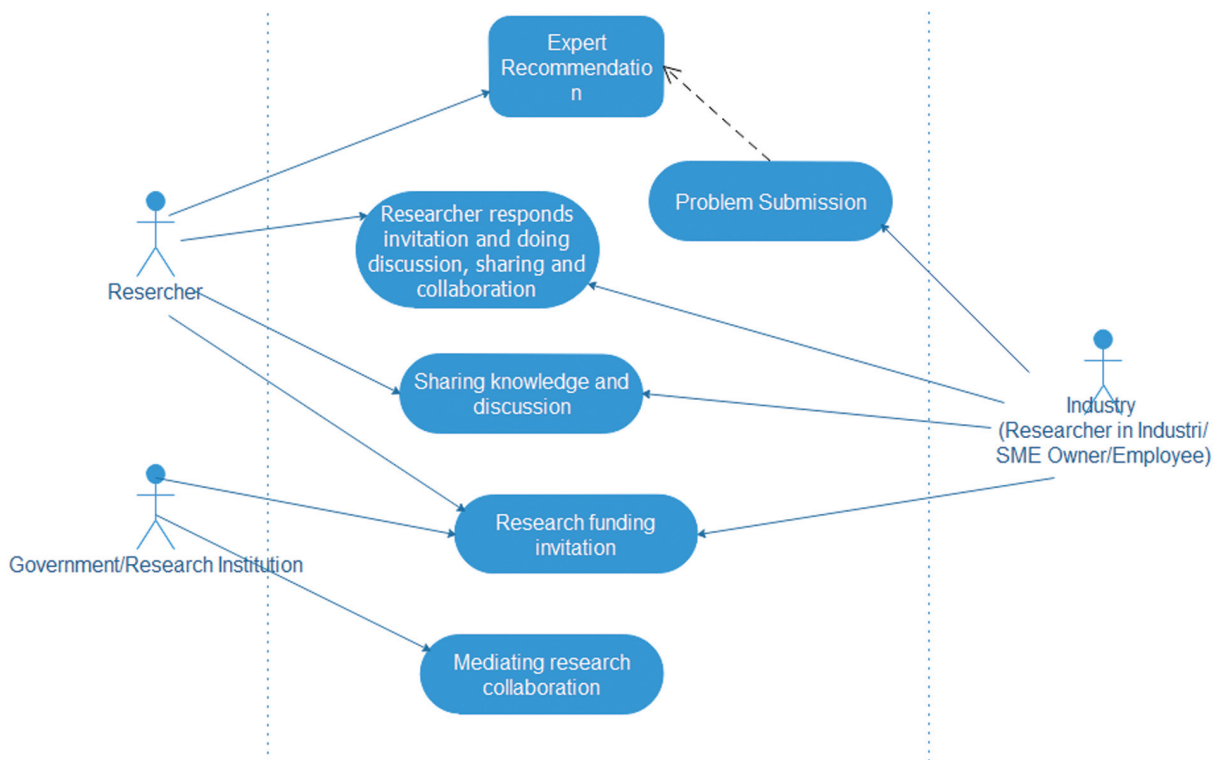


Figure 5. Usecase diagram for digital platform.

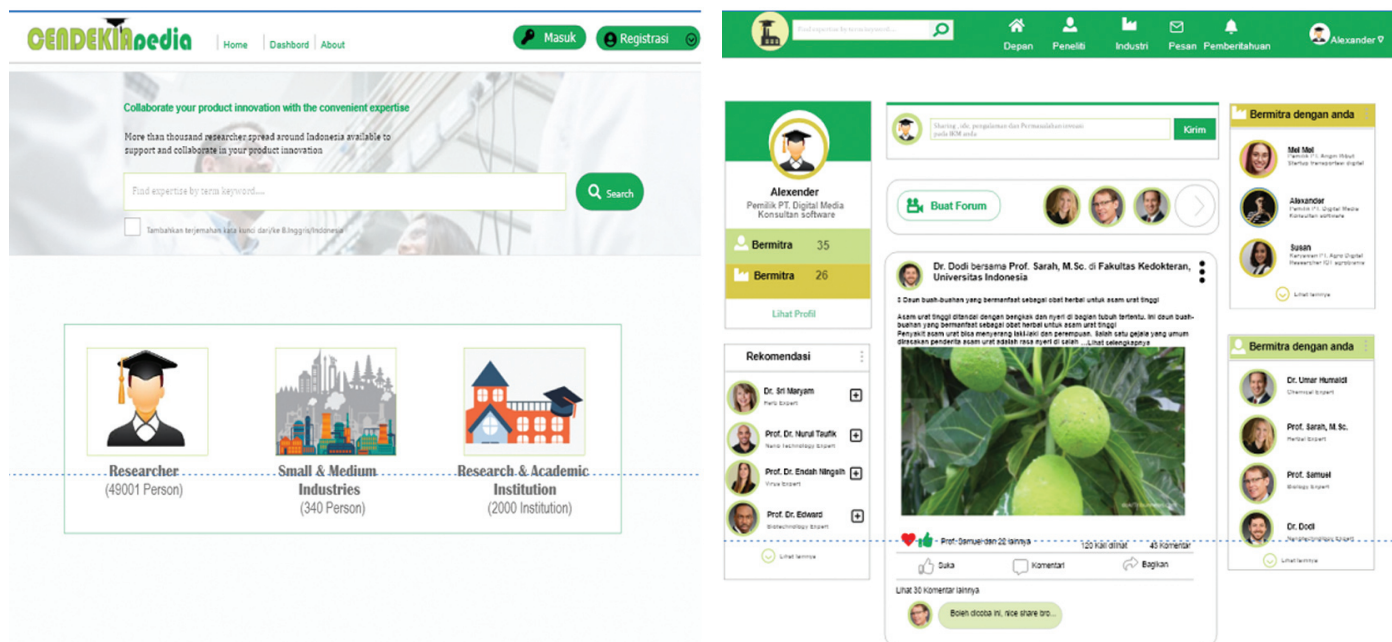


Figure 6. Mockup design for digital platform.

research is expected to complement the components of digital activities that are valuable as sources. SMEs expect solutions that other stakeholders can provide regarding constraints in the production process. This solution is expected to increase the competitive advantage for SMEs.

Furthermore, increasing innovation will also have an indirect impact on the government. Therefore, the government is also expected to become an intermediary that functions as a supervisor, regulator, and standard maker supporting the collaboration process. It is in line with previous research that supports management as one of the factors that will affect the success of building a collaborative ecosystem. In this research, the government is the actor in providing management support²⁶. In addition, the right platform to connect is the main thing in collaboration. In this case, the government can provide a platform for SMEs and researchers to meet online and offline. This platform will also allow researchers and SMEs to share knowledge and add relationships and insights. For the sustainability of this program, it is necessary to monitor and control regularly to measure the performance and effectiveness of SMEs and researchers. The model created can be a reference for building a platform that suits the needs of researchers and SMEs.

The agreement between researchers and SMEs needs to be considered in the collaborative process to achieve innovation. To maintain collaborative relationships and develop a sense of trust, researchers and SMEs need to continue to share information. Trust is an essential factor in long-term collaboration. Trust between researchers and SMEs will affect knowledge sharing so that collaboration will be achieved as desired²⁷. Contractual safeguards are also needed to increase trust between researchers and SMEs. Contractual safeguards can protect interests and coordinate activities between researchers and SMEs to create information transparency²⁸.

Several things concern SMEs and researchers in the product development process, one of which is technology.

Inadequate knowledge and a low level of technology are common in most SMEs in Indonesia. On the other hand, adapting to technology is an essential point on the side of researchers. One of the reasons technology is an obstacle to SMEs is the lack of funds to realise high-tech business ideas. According to Karadag (2015), lack of innovation due to high development costs is the leading cause of the unsatisfactory level of modern SME technology.

9. CONCLUSION AND FUTURE RESEARCH

The study provides an overview of a conceptual model supporting the innovation process through information sharing and collaboration. This model can be used as a reference when building systems/applications to support collaboration between researchers and SMEs. Based on the interviews, both researchers and SMEs hope that the government can enormously contribute to increasing innovation.

This study suggests future research to test or implement the model that has been built. In addition, this research is still limited to specific stakeholders. This study only focuses on the needs of researchers and SMEs. Future research can further identify the needs of other stakeholders, such as investors, venture capital, and markets. Collaboration with various stakeholders tends to lead to improving product quality and ideas. Its turn will affect product innovation²⁹.

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Contribution in the current study: Data collection, formal analysis and draft writing.

Annexure I

Interview questions and responds with gap in proposed conceptual model

Questions	SME manufacture	SME cake home industry	Gap in proposed a conceptual model
How is the product innovation process carried out in your company so far?	<ul style="list-style-type: none"> • Increase added value through functional changes when the market is saturated. • Market research (consumer behaviour) • The safest innovation is to improve old products 	<ul style="list-style-type: none"> • Innovation sees the market (don't 360 degrees) • Product innovation ideas from viral social media • Inviting chefs to make new products 	Cooperation to conduct market research
Who is needed/involved by external parties and their role in the innovation process?	<ul style="list-style-type: none"> • External mentors (experts) • Through seminars • Sources from existing / best practices • Come to local government agencies for consultation • Consultation with environmental activists, • Academics (opportunity calculation) • consultations between SMEs. 	<ul style="list-style-type: none"> • Through online courses • From youtube • A chef from big industry (sponsor) 	<ul style="list-style-type: none"> • Actor researchers from large industry Research • Collaboration with researchers from large industry • Discussions between SMEs
What are the patterns of interaction with external parties to assist in the innovation process of SME products?	<ul style="list-style-type: none"> • Many resources on google to find sources or coaches • Communication via social media (WA) • Come directly to the expert 	From acquaintances, even many chefs are looking to be partners	<ul style="list-style-type: none"> • External researchers looking for SMEs to partner with • Channels of communication with the expert • Discussion between SMEs
What is the resistance that appears in sharing knowledge?	The current era is openness, for protection of patents/copyrights.	<ul style="list-style-type: none"> • Invitation for seminars to vocational high School • Sharing to increase income (private class training (workshop)) • Recipes are private • Sharing on social media groups in WA between SMEs for general matters, not specifics regarding recipes 	<ul style="list-style-type: none"> • The knowledge shared is private (knowledge transfer) • Knowledge is shared, which is public