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A Model of Government Intervention upon a Technology Transfer Program for the Product Innovation Improvement of Food Micro-Small Enterprises

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Many food micro-small enterprises (F-MSEs) were forced to close their businesses due to the COVID-19 pandemic. Only recently, they have been able to reopen with strict safety measures. Subsequently, F-MSEs have had to become creative and innovative to keep the business alive, and government intervention is urgently needed. Research Division for Natural Product Technology - Indonesia Institute of Sciences, a state-owned research institute, has a track record in technology transfer programs to escalate product innovation. This study investigates the government intervention conducted by the aforementioned institution to F-MSEs and aims to build a conceptual model of government intervention upon a technology transfer program to promote product innovation. A mix method was employed in this research, which was comprised of: a soft system methodology to identify complex and unstructured problems; interpretive structural modelling to analyse the interaction issues on the elements correlating with the program; strategic assumption surfacing and testing that helped to answer the critical assumptions, as also the requirement for running the model; and a business model canvas to map the desirable and feasible change. A conceptual model resulted from this research, which is the institutional model. Cross institutional collaboration plays a significant role in maximising the program. And, the most fitting program is thematic intervention, the technology transfer that is given according to the needs and capability of each cluster formed.

Keywords: *Government intervention, Institution model, Mix methods, Product development, Soft system methodology, Technology transfer.*

Introduction

The 'new normal' situation is a state to which economy and society settles following a crisis after it differs from situation that prevailed prior to start of crisis. It is currently reimplemented in many countries, including in Indonesia to stabilize crisis condition in COVID-19 pandemic. The Government of the Republic of Indonesia has issues instruction and the authority to regional governments to perform the 'new normal' in their respective regions. At the early stage of the partial lockdown, food businesses were not allowed to have customers dining in their restaurants. These days, under more relaxed measured, they may have customers dining in their restaurants, provided that they comply with health protocols in accordance with the regulation related to the recovery of trading activities during the COVID-19 pandemic and new normal (Circular of the Minister of Trade of the Republic of Indonesia number 12 of 2020). Aside from the regulation limiting the number of dining customers, most customers prefer to buy their food through a delivery service. In this respect, people need hygienic, nutritious, and neatly-packaged food products with a long shelf life to boost their immunities in this new normal.

Sadly, food micro-small enterprises (F-MSEs) would not survive without good quality and improved products. Suggestions in product improvement are among the key elements that help their product to meet customer specifications and demands (Adamu et al., 2020). To enable product innovation, supporting elements like technology, funding, and other resources, are essential. This condition is inadvisable for F-MSEs related to the scale of business. Hence, this is where the government needs to take part through intervention, as the government fulfils a significant role in their contribution towards food availability in the area. Aside from this, F-MSEs' products mostly use local natural resources; the natural resources that containing bio-active components are prospective to be developed as functional foods, and offer numerous benefits for health, (Lau et al., 2013; Hariyadi, 2010).

The intervention activity which is aligned with what F-MSEs currently require, is to undertake product innovation. To enable that objective, collaborations between government and the private sector are crucial (Danse et al., 2020). Studies regarding government intervention on micro-small and medium enterprises (MSMEs) started to emerge in the late nineteen-eighties. On one hand, government intervention was defined as support for MSMEs sector, which encountered many difficulties accessing resources in the market, as opposed to large firms. On the other, government intervention was defined by the important role government plays in terms of employment creation, value added creation, and innovation (Stiglitz & Weiss, 1981; Birch, 1987; Minniti, 2008; Mason, 2009; Davidsson et al., 2006; Shane, 2004). The studies pertaining to technology support by government for MSEs have been carried out by several researchers. However, a number of results did not meet the expectations. Bharati (2006), in his study, developed a survey where respondents were asked to identify any factors that might influence their decisions to employ specific technology solutions. The responses showed that government agencies were not among the influences. Kusumawardhani et al. (2015) found that government agencies still tend to be partial on regional

science and technology activity and remains unintegrated. Meanwhile, intervention is ineffective when carried out partially (Fombasso & Cincera, 2015).

Technology transfer could have various objectives, such as escalating the production process, supply chain, marketing, and so on. This research focusses on technology transfer for product development, which will add more value as the 'new innovation' applied to food MSE products. The government intervention surely includes other relevant institutions, while integration between institutions is much needed for the intervention to work. Ar and Baki (2011), in their study, found that organisational collaboration affects the innovation process upon small enterprises. Thus, this study is dedicated to build an integrated conceptual model of government intervention upon a technology transfer program to elevate product innovation for MSEs in the food sector.

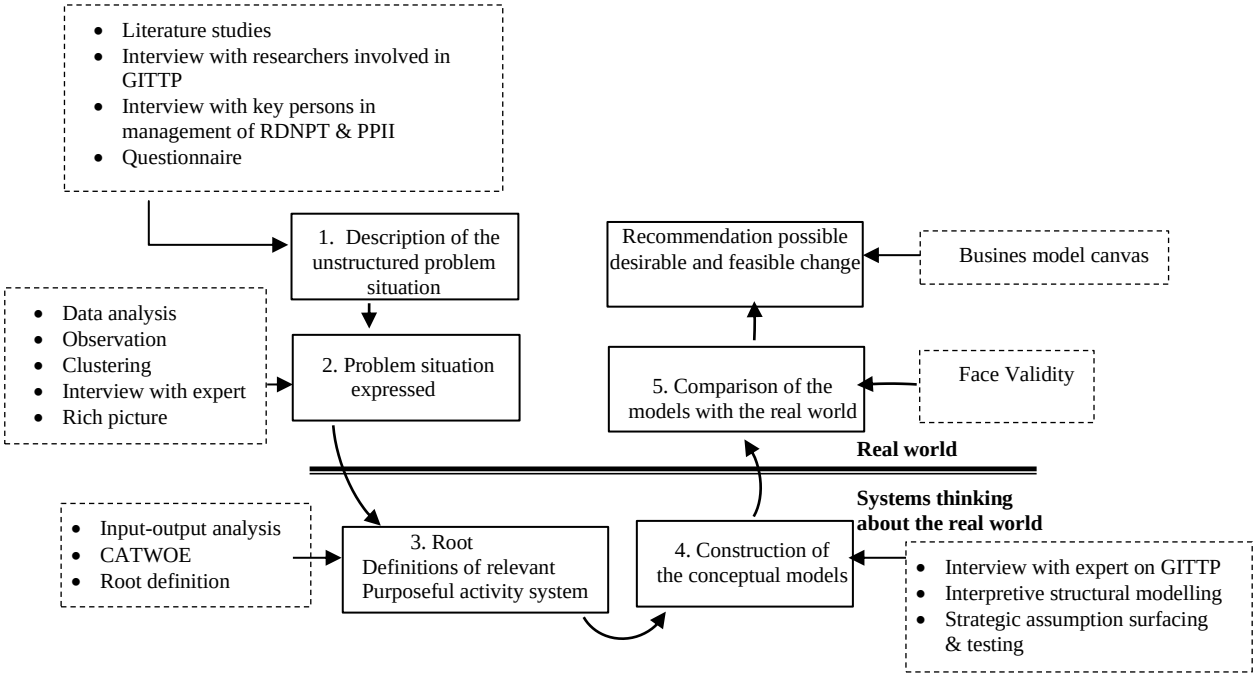
Method

Research Framework and Stages

The soft system methodology (SSM) is made to build a model from related systems in the problem situation. These models are then used as discussion media to bring changes in the actual situation. Checkland (2000) differentiates the approach system into a soft system, and a hard system. The soft system thinking is used in a problem-solving situation which is unstructured and affects the social, cultural, and humanity aspects. On the other hand, the hard system thinking, with its optimisation paradigm, is used for technical problem solving that is structured and has a clear objective. Christis (2005) stated that the SSM places the character as interpretation, which is why, if the problem has the nature of complexity or messy or ill defined, it will determine it as the right choice to be used.

This study uses the SSM approach until stage five (Checkland, 2000; Hardjosoekarto, 2013; Wang et al., 2015). Firstly, identifying the current conditions and problems relating to government intervention focussing on a technology transfer program intervention to be used upon F-MSEs to improve product innovation. Secondly, understanding the issues that the stakeholders encounter relating to their needs, roles, and responsibilities. This step makes it possible to create a rich picture which describes the interconnection of problems that the stakeholders encounter. Thirdly, defining and determining the roles of each stakeholder based on the Client or Customers, Actors, Transformations, World-View, Owner, and Environment Constraint (CATWOE) Assessment. Fourthly, designing a conceptual model which describes the required actions, as well as the interconnection between the activities to synthesise the best possible solution to strengthen the institutional aspect. Furthermore, this step makes it possible to find the key element that significantly affects the strengthening efforts by combining Interpretive Structural Modelling (ISM), and Strategic Assumptions Surfacing and Testing (SAST), which helped to answer the critical assumptions, as the requirement for running the model. Fifth, and lastly, a comparison of the models with the real word. The research framework is shown in Figure 1.

Figure 1. Research framework (adopted and modify from Checkland and Scholes, 1999)



Data collection

The data in this research were obtained through observation, direct interview, and a questionnaire distributed to F-MSEs, and experts. An initial interview was conducted to researchers, and other key persons involved in Government Intervention in Technology Transfer Program (GITTP), with questions focussed on the research result that is intended, GITTP activity, and occurring obstacles. Moreover, further interviews, and a questionnaire distribution were also conducted to F-MSEs to collect descriptive data (clustering and analysis on F-MSEs). In the first stage, the data gathering was used to find and identify the problems occurring in the GITTP.

In the next step, a discussion and survey for experts were developed to build the conceptual model. The expert survey was used to develop and analyse the interaction issues on the elements correlating with the program. The survey was given to 12 experts, who came from various backgrounds including: academia, practitioners, regional government, MSMEs representatives, key person on RDNPT, the Center for Utilisation and Innovation of Science and Technology (CUIST), and the Ministry of Research and Technology (MRT). Eight valid questionnaires were obtained from the 12 surveys completed by the experts, which could be subsequently be processed. This step continued with a second expert discussion, and a survey, which were performed with the objective to arrange critical assumptions, as the requirement for running the model.

Analysis & Discussion

1. Description of the unstructured problem situation

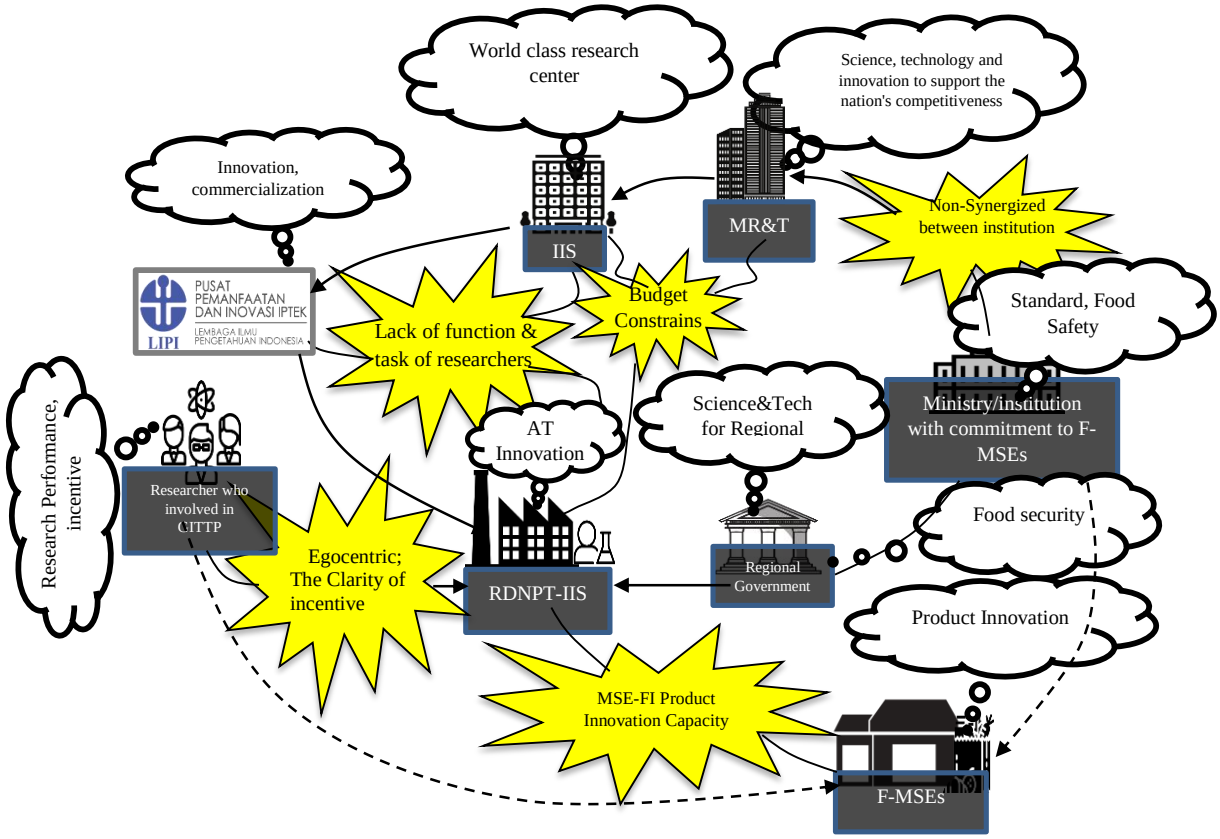
According to Williams (2005), the problem disclosure on the SSM begins by explaining the research object condition in general, continued with a deeper and thorough study of the related aspects. The front liner of the GITTP on F-MSEs to increase product innovation is the Research Unit for Natural Product Technology, which is located in the special region of Yogyakarta. Furthermore, the related institutions regarding this intervention are: the Minister of Research and Technology of the Republic of Indonesia; Indonesia Institute of Sciences; Centre for Utilisation and Innovation of Science and Technology; the regional government, and related ministerial and government institutions which are committed towards F-MSEs, such as the Department of Standardisation Management, and the Ministry of MSE. The complex and dynamical problems upon the GITTP should be inventoried, from the internal needs of the program and up to the needs of MSMEs in facing the changes of consumer demands. The identified problems relate to the budget, technology access, technology supporting tools and facilities that will be accessed by F-MSEs, and the mechanism/s to run the program. The next step comprises an analysis of the needs of each stakeholder and/or actor involved, which later, can visualise the GITTP activity situation.

F-MSEs have a variety of products. Thus, we divided the type of the products according to the water content and categorised in two types: wet food products, and dry food products. For products that have a water content of less than four per cent, per 100 grams, they were classified as wet food products. Comparatively, for products that have a water content of more than four percent per 100 grams were classified as dry food products, referring to National Standard of the Republic of Indonesia SNI 01-2886-2000. The size of the business was divided into the two types of micro or small, which refers to the guidelines from regulation number 20 year 2008, Government of the Republic of Indonesia, 2008. Therefore, F-MSEs, under the guidance of RDNPT, have been clustered into four categories: micro enterprises that produce a wet food product, micro enterprises that produce a dry food product, small enterprises that produce a wet food, and small enterprises that produce a dry food product. Clustering is required to decide the type of intervention approach that is on target, so that the intervention program can be absorbed effectively and according to the needs of F-MSEs.

2. Problem situation expressed

The second step was to develop a rich picture according to the situational analysis that was performed on the GITTP to increase the product innovation. Several points obtained as the following: 1) Non-Synergized between institution; 2) Limited Budget; 3) Lack of function and task of researchers who involve in GITTP; 4) Egocentric of researchers that mostly hampered team works; 5) The clarity of incentive mechanism; 6) F-MSEs lack of innovation capacity. Problem mapping with related institutions is explained through the rich picture on the **Figure 2**.

Figure 2. Problem mapping with related institutions



3. Root Definitions of Relevant and Purposeful Activity System

The third step in the SSM is determining the root definition. To determine the root problem, a search is conducted upon six elements: Customer, Actors, Transformation, Worldview, Owner, and Environment (CATWOE). Hereafter, the mapping of Customer, Actors, Transformation, Worldview, Owner, and Environment is enclosed in the Table 1.

Table 1: *Element CATWOE*

Customer	Food Micro Small Enterprises under the guidance of RDNPT IIS
Actors	RDNPT IIS
Transformation	Government intervention program on appropriate technology transfer
Worldview	F-MSEs: - Product innovation to meet the demands of consumers. - Enhance innovation capacity. RDNPT: - Continuous technology transfer/diffusion program - Continuity of appropriate technology research.
Owner	IIS
Environment	Regulation of technology transfer, incentive system, team work of HR in GITTP, integration with related institution, budget constraints, SOP program, researchers' task & function, activity information portal.

The root definition is a brief but thorough statement about the intervention system. The determination for the root definition can be achieved through the P-Q-R method, specifically by elaborating: do 'P' using the 'Q' way to contribute to achieving 'R' ('P' = what is being done; 'Q' = how to do it; and 'R' = why it has to be done). Aside from this, the rich picture can also provide the feedback for the root definition improvement. Clearly the *root definition* from this problem is: Model for government intervention on technology transfer program towards F-MSEs through: regulatory improvements; incentive system; enhancing team work; program that is integrated with other institution; budget policy; drafting of SOP program; compatibility of researchers' tasks and functions; improvement in information with digital based; and training program to enhance the skills of HR that are involved, to increase product innovation and innovation capacity of F-MSEs, in line with research continuity of appropriate technology.

4. Construction of the conceptual models

The fourth step in the SSM is to compile the conceptual model (conceptual models of the system named in the root definition). It is an activity analytic method used to establish tasks for the actors in completing their transformation. The performance of Purpose Activity Model (PAM) is controlled by two criteria: its efficiency, and effectivity. It is shown in the PAM diagram that the activity to develop the internal regulations, training in enhancing the capacity of actors, budget planning, and program socialisation are done at the beginning, before the intervention activity. Aside from this, there are also activities to create synergy with other related institutions.

The thematic intervention will be implemented according to the needs of each cluster that is formed. The interventions for wet food products include sterilisation technology, canning, and retort pouch. The wet food products were categorised into five types, according to their characteristics. Firstly, wet food product with a combination of solid ingredients. Secondly, food product with vegetable base ingredients with a sauce. Thirdly, food product with meat and fish ingredients using a sauce. Fourthly, food product that is cooked in a canning kitchen. Fifth, and lastly, processed food products that are fermented. This grouping is related with quality control on the canning technology process. For the dry food products, the technologies offered are food processing technology (production machinery, such as drying machine, coconut grater machines, bean grinders, and spinners), and phytopharmaceutical technology and packaging. The dry food products were categorised into three types. Firstly, cocoa processing, which includes roasting, separation of the cacao skin and nib, the making of chocolate candy with a ball mill, pressing the chocolate paste, and alkalinisation. Secondly, peanuts processing, which is a technology transfer that is given and includes the product improvement. Third, and lastly, processed beverages into a solid form (Irwanti et al., 2020). The efficiency control, whether the result came from PAM, occurred by using minimal resources. The effectivity is related to whether the transformation achieved will last for a long time and provide a contribution upon the strategic objective, as can be seen in **Figure 3** below, Purpose Activity Model.

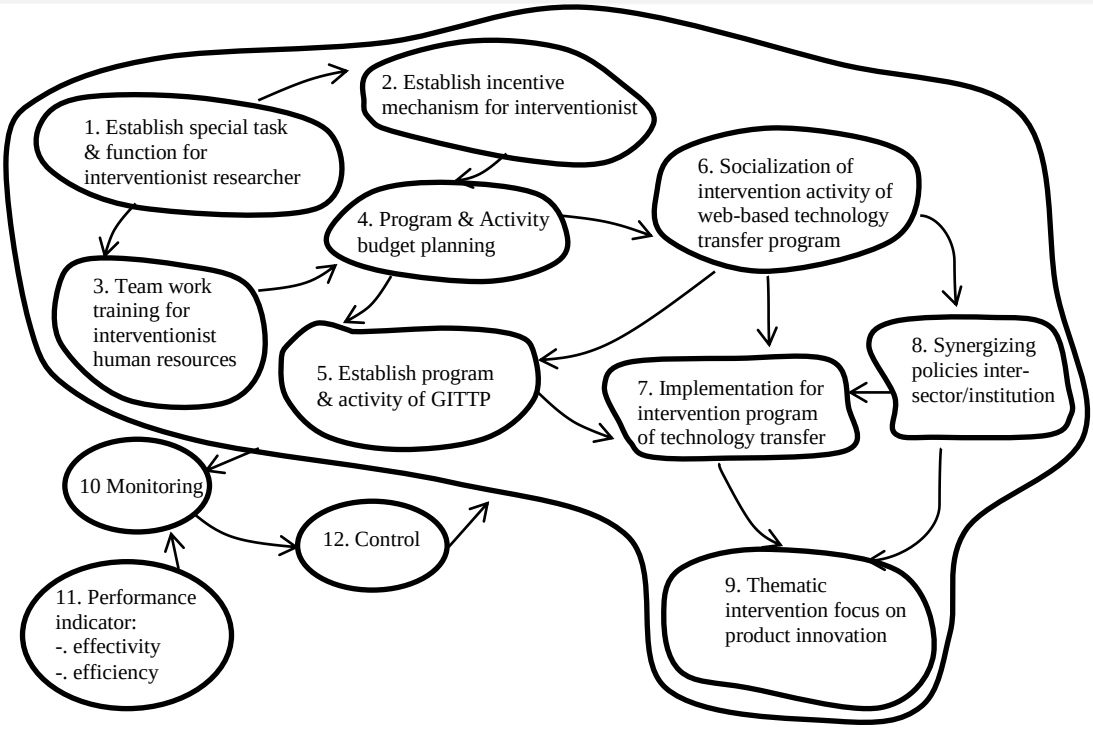


Figure 3. Purpose Activity Model

The conceptual model in this study is aimed at reengineering the model of government intervention upon the technology transfer program for F-MSEs to increase product innovation. It is developed from deductive approach using the interpretive structural modelling (ISM) method, and inductive approach using the SSM framework, which is shown in the PAM, as the conceptual model.

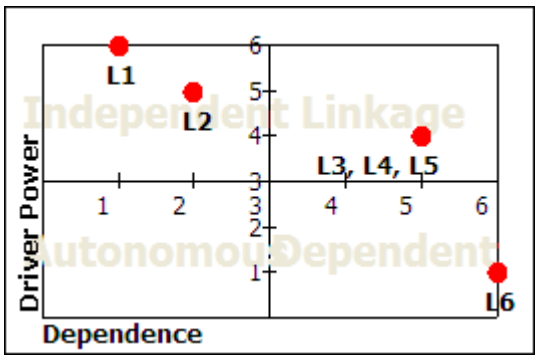
4.1 Interpretive structural modelling (ISM)

ISM is used to identify and develop relations among certain variables, then establish an interrelationship between the less structured variables in the literature, based on the experts' opinions and group discussion (Kumar & Rahman, 2017). Thakkar et al. (2005) stated that ISM is a process that translates a mentality model, which makes its application highly recommended. ISM is required for deductive model arrangement. The modelling begins with an in-depth interview with the experts, who really understand the GITTP activity for F-MSEs. The experts agreed to use six from nine elements of ISM. These elements are: (1) The institution involved in execution of the program, (2) The needs of the program, (3) Objective, (4) The alterable which could be alternate, (5) Major constraints (6) Benchmark. To design structural *Self-Interaction Matrix* (SSIM), started with variable identification and then picking relevance contextual relationship, continue, a comparison pair from variable, which later on design *Reachability Matrix* (RM), and develop graphic. Graphic representative from individual power and elements dependency that are being identified is in the classification on categories representing each part of subjects acted as variable in the program (Saxena et al., 1992).

Each elements and sub-elements are analysed using ISM and build upon information from the results of expert survey. The results, are as follows:

A) Element of Institution

Sub-elements: L1: Ministry of Research and Technology (MRT), L2: Indonesian Institute of Sciences (IIS), L3: Center for Utilisation and Innovation of Science and Technology (CUIST), L4: Research Division for Natural Product Technology (RDNPT), L5: Regional Government, and L6: F-MSEs.



Level 1: L6
⇧
Level 2: L3, L4, L5
⇧
Level 3: L2
⇧
Level 4: L1

Figure 4. Institution Element Matrix

On **Figure 4**, institution element matrix, the matrix showed that the sub-element of the Ministry of Research and Technology resides in the independent quadran. The Ministry of Research and Technology, on the bottom level, shows that the Ministry of Research and Technology has become the driving power. The sub-elements on quadrant linkage are the Centre for Utilisation and Innovation of Science and Technology, the Research Unit for Natural Product Technology, and the regional government. The Centre for Utilisation and Innovation of Science and Technology must appertain with the Research Unit for Natural Product Technology, as well as the regional government, to support F-MSEs through intervention programs.

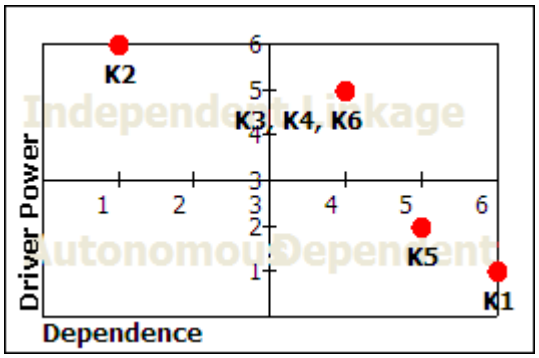
B) Element of the Needs of the Program

The sub-element of the needs of the program is comprised of the following: K1, appropriate technology for F-MSEs; K2, the availability of clear incentive rules for the researcher/s and team/s which are involved in the program; K3, the availability of supporting infrastructure; K4, qualified human resources that execute the GIPTT; K5, digital bases of information access for the GIPTT; and K6, the management and Standard of Procedures (SOP) of the GITTP.

The result, as shown in Figure 5, highlights clear incentive rules for the researcher/s and team/s involved in the program, which is located in the ‘level four’ or ‘high independent and high driver power’. This highlights that the availability of clear incentive rules for the researcher/s and team/s involved in the program is crucial to encourage researchers. Furthermore, qualified human resources,

the availability of supporting infrastructure, and the SOP of intervention upon technology transfer, collectively, will improve because researchers will be more motivated. If these three interrelated aspects are improved, then the digital bases for the GIPTT information access will have greater implementation, and will accelerate the availability of appropriate technology for F-MSEs.

Figure 5. Matrix for the Needs of the Program

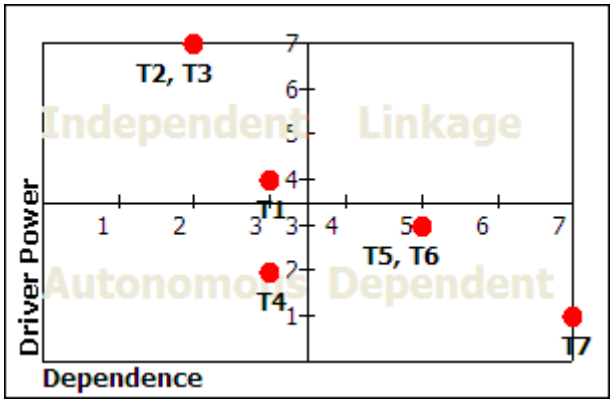


Level 1: K1
Level 2: K5
Level 3: K3, K4, K6
Level 4: K2

C) Element of Objectivity

The sub-elements of the objectivity element include: T1, the facilitation of appropriate technology tools for F-MSEs; T2, producing the policy of job and function to strengthen the GITTP; T3, producing a F-MSEs policy of product standardisation , which is synergised with the GITTP; T4, strengthening the incentive mechanism for the researcher/s and team/s involved in the program IPPAT; T5, increasing the product innovation of F-MSEs; T6, increase the quality of food safety; and T7, enhance the market of F-MSEs. The result of the element of objectivity is shown in Figure 6.

Figure 6. Matrix for the Element of Objectivity



Level 1: T7
Level 2: T4, T5, T6
Level 3: T1
Level 4: T2, T3

The matrix shows that the producing of a policy of job and function to strengthen the GITTP, and producing a F-MSEs policy of product standardisation, which is synergised with the GITTP, are located in the independent quadrant. These sub-elements are the driving power. The final objective (level 1) that is shown in this sub-element, is to enhance the market of F-MSEs, which can be

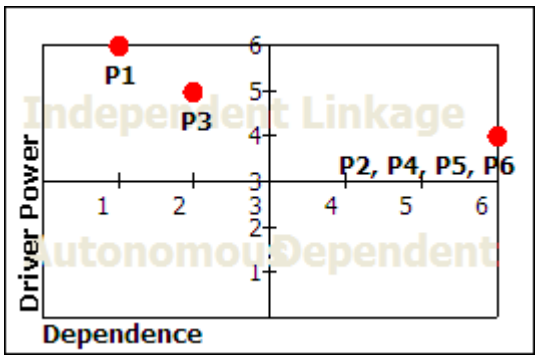
implemented by increasing product innovation; improving the quality of food safety; and strengthening the incentive mechanism, which will motivate the researcher/s and the team/s involved in the GITTP.

D) Element of Alterable

The alterable element is comprised of the following sub-elements: P1, government regulation of the GIPTT program; P2, product innovation on the SME-FI; P3, a GITTP human resources executor that is skillful; P4, market access development; P5, a standard for the production process; and P6, an information system with a digital basis.

The results are shown in Figure 7. For the sub-element of alterable, the driving power is government regulation of the GITTP. It will push skillful human resources involved in the transfer technology, and if this runs well, it can subsequently push the product innovation on the SME-FI (through the intervention program), and all sub elements in the level one.

Figure 7. Matrix for Element of Alterable

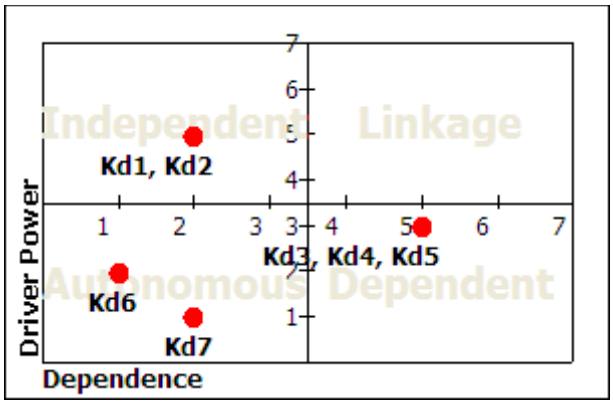


Level 1: P2, P4, P5, P6 ⇧
Level 2: P3 ⇧
Level 3: P1

E) Element of constraints

The element of constraints sub-elements are as follows: Kd1, budget constraints; Kd2, weak policy for the GIPTT program; Kd3, obscurity for the researcher's job and function in the GITTP program; Kd4, impacts of researcher egocentricity; Kd5, weak coordination between the unit in the IIS; Kd6, a gap in the organisational capacity of the MSEs (regarding business scale) for the GITTP recipient; and Kd7, weak concern regarding the GITTP recipient (F-MSEs) undertaking product innovation.

Figure 8. Matrix for Element of Constraints



Level 1: Kd3, Kd4, Kd5, Kd7
Level 2: Kd1, Kd2, Kd6

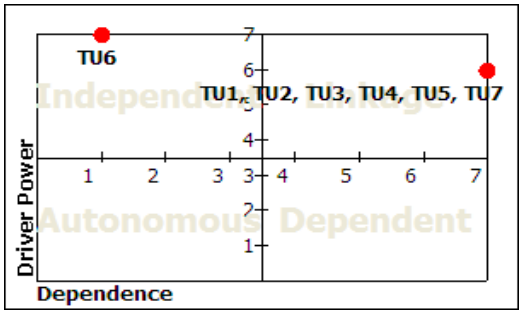
The matrix for the element of constraints is shown in Figure 8. The driver powers are budget constraints, a weak policy for the GIPTT program, and a gap in the business scale of MSEs.

F) Element of Benchmark

The element of benchmark sub-elements are: TU1, the number of applicated technology and devices used by F-MSEs; TU2, the number of outputs produced by using a technology transfer; TU3, the increase in the number of memorandum of understandings (MoUs) with F-MSEs; TU4, the increase in turnover of the F-MSEs; TU5, expanding the market access of F-MSEs; TU6, the arrangements of tasks and functions for the researcher/s involved in the GITTP; and TU7, the increase in the number of product innovations.

The results, as shown in Figure 9, highlight the sub-element producing the arrangements of tasks and functions for the researcher/s involved in the GITTP has become a driving power. Meanwhile, other sub-elements, such as the number of technologies used by the F-MSEs, the number of outputs produced using a technology transfer, the increase in the number of MoUs with F-MSEs, the increase in turnover of F-MSEs, expanding the market access of F-MSEs, and the increase in number of F-MSEs under guidance, are all related to one another.

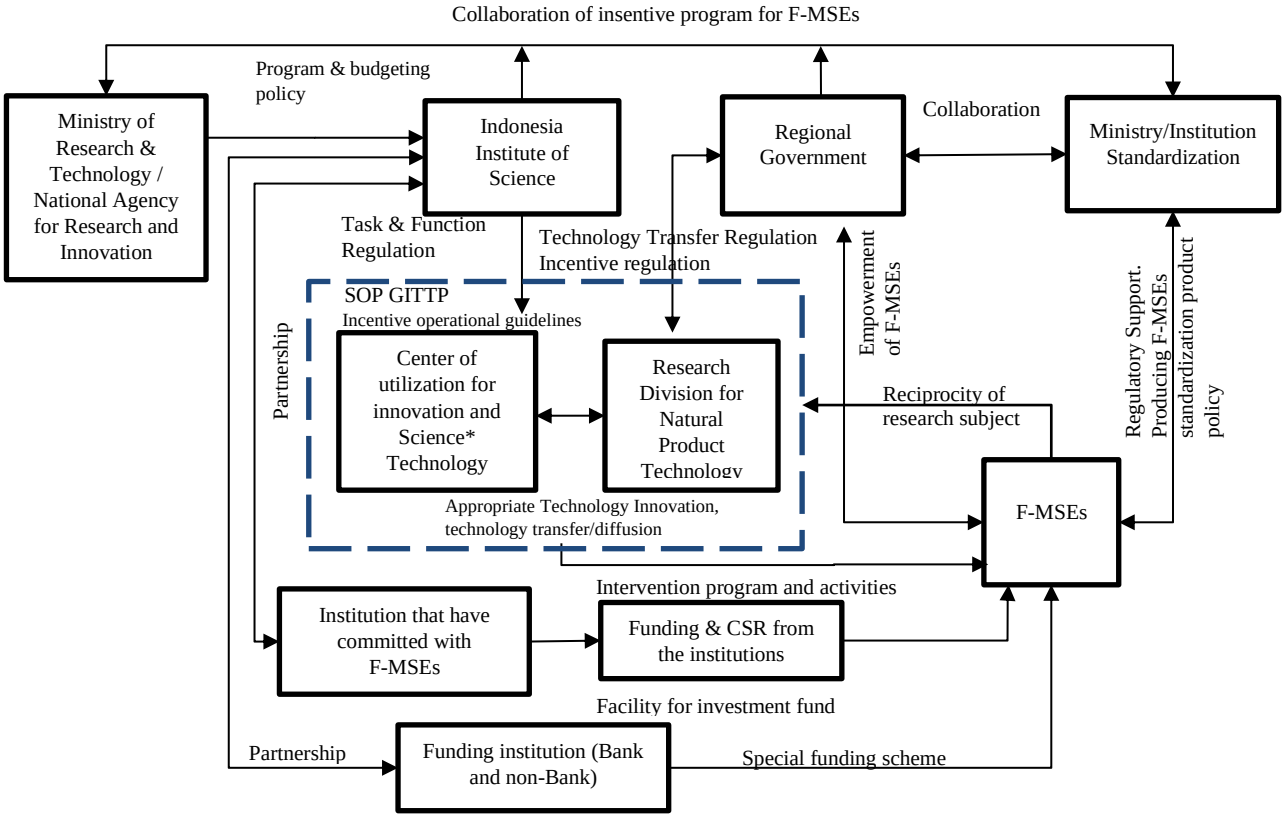
Figure 9. Matrix for Element of Benchmark



Level 1: TU1, TU2, TU3, TU4, TU5, TU7
Level 2: TU6

The sub-elements which perform a role as the driving power for model development are outlined as follows. Firstly, the Ministry of Research and Technology of the Republic of Indonesia, as an institution which has an important role as a driving power for the other related institutions. Secondly, the availability of clear incentive rules for the researcher/s, and team/s involved in the program. Thirdly, producing a job and function policy to strengthen the GIPTT, and producing a food MSE specific standardisation product policy, which is synergised with the GIPTT. Fourthly, government regulation of the GIPTT. Fifthly, budget constraints, a weak policy for the GIPTT, and a gap in the business scale of the GIPTT recipients. Sixth, and lastly, the arrangements of tasks and functions for the researcher/s involved in the GITTP. The result of the conceptual model that was built based on the SSM, and ISM, is shown below in Figure 10.

Figure 10. Conceptual Model of the GITTP for MSEs in the Food Sector to Increase Product Innovation



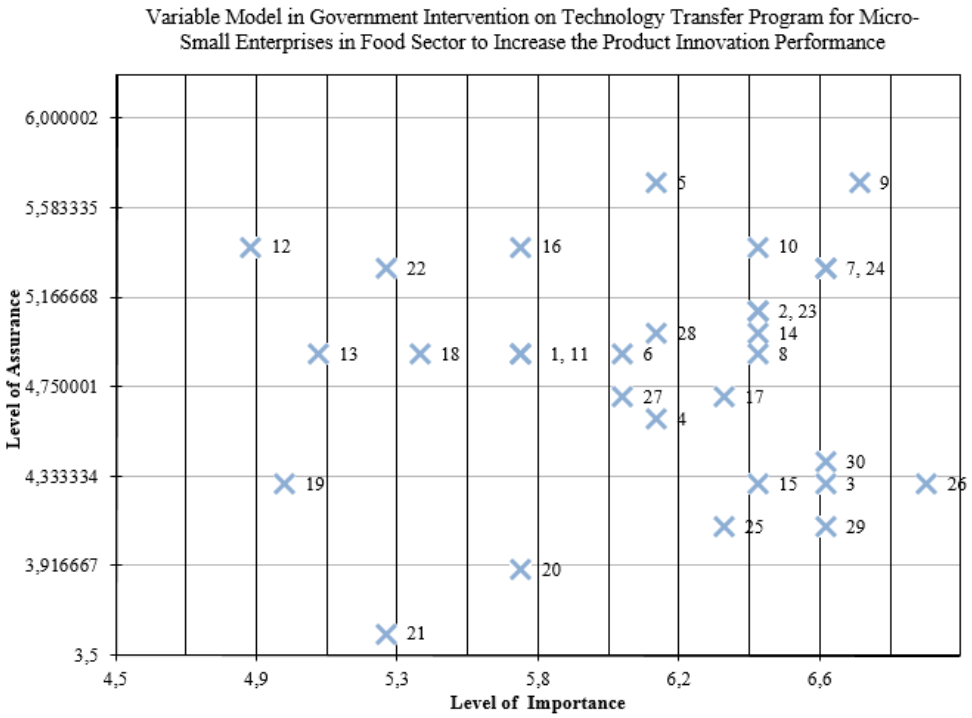
Strategic Assumption Surfacing and Testing (SAST)

The resulting model will run well if all its strategic assumptions are fulfilled. In this research, the strategic assumption surfacing and testing (SAST) method was applied to analyse the critical assumption in this study. The SAST method was founded by Mitroff in 1981. Zlatanovic (2016) stated that the SAST method represents an interpretative methodology system, which is relevant to solve unstructured and ill-defined problems. It is suitable to be used in situations with pluralistic problems, which focus on political and cultural aspects within organisations. The SAST method is a framework to repair a system from assumption that can be easily applied in the real world (Raharja et al., 2020).

Moreover, the SAST method focusses on fundamental and critical assumptions, which enables application of a conceptual model, it is aware of the plan that will be undertaken and defines the strategy for system reparation.

In this study, assumption is determined through a discussion with experts. The formed variables created from the experts' opinions in this study are the variables of: infrastructure, competency, policy, budgeting, human resources who run intervention program, human resources who receive the intervention program, and institutional. The assessment and ranks are based on how important the variable is in creating an affect, and the likelihood that it will run well. This is based upon two criteria. Firstly, the assessment scale between '1–7', where 'scale 1' is the 'least important', and 'scale 7' is the 'most important'. Secondly, the likelihood that the variables will run well when the business model is implemented. The assessment scale is between 1–7, where 'scale 1' is the 'most uncertain', and 'scale 7' is the 'most certain'. The assessment result, according to the experts' opinions, is shown in Figure 11.

Figure 11. Variable Ranking Based on Importance and Assurance



The table scoring variable was based upon the importance and assured occurrence, as shown in Table 2 below.

Table 2: *Table scoring variable based on the importance and assured to occur*

No.	Aspect	Variable	Importance	Rank	Assured to occur	Rank	Rank Aggregate
1	Infrastructure	Laboratory on transfer technology program for Food SMEs that are already standardised	5.714	20	4.857	13	16.5
2	Infrastructure	Appropriate technology for technology transfer program to function well	6.428	7	5.142	9	8
3	Infrastructure	Easy access for partnership system of technology transfer program	6.571	3	4.285	22	12.5
4	Infrastructure	Easy access on appropriate technology system	6.142	15	4.571	21	18
5	Competency	Competence of researcher who innovates the appropriate technology	6.142	16	5.714	1	8.5
6	Competency	Instructor competency in intervention program for technology transfer (IPPT)	6.000	18	4.857	14	16
7	Competency	Intervention executor creativity is in line with the needs of Food SMEs	6.571	4	5.285	6	5
8	Competency	Promotion expertise of technology transfer program	6.428	8	4.857	15	11.5
9	Competency	Invention of appropriate technology	6.714	2	5.714	2	2
10	Competency	Management competency of supporting human resources in the execution of IPPT program	6.428	9	5.428	3	6
11	Competency	Readiness of the instructor human resources for the change	5.714	21	4.857	16	18.5
12	Policy on Technology Transfer for Food SMEs	SME criteria referring to regulation number 20 year 2008	4.857	29	5.428	4	16.5
13	Policy	National innovation system regulation number 11 year 2019	5.142	27	4.857	17	22
14	Policy	Business process according to the provision of technology commercialisation	6.428	10	5.000	11	10.5
15	Policy	Incentive system according to the regulation from the Ministry of Finance	6.428	11	4.285	23	17
16	Policy	De-bureaucratisation	5.714	22	5.428	5	13.5
17	Funding	Innovation commitment budgeting	6.285	13	4.714	19	16
18	Funding	Multitude Business Credit Program	5.428	24	4.857	18	21
19	Funding	ULTRA Micro program from Ministry of Finance	5.000	28	4.285	24	26
20	Funding	Micro venture capital	5.714	23	3.857	28	25.5
21	Funding	Funding partnership using crowd funding	5.285	25	3.571	29	27
22	Human Resource (Program provider)	The quantity of human resources in the civil apparatus is adequate	5.285	26	5.285	7	16.5
23	Human Resource (Program provider)	Professional human resources	6.428	12	5.142	10	11
24	Human Resource (Program provider)	Chief commitment	6.571	5	5.285	8	6.5
25	Human Resource Food SMEs	SME human resources have the capacity to perform technology adoption	6.285	14	4.142	26	20
26	Human Resource Food SMEs	SME human resources' commitment	6.857	1	4.285	25	13
27	Institution	Institution concern for food SMEs	6.000	19	4.714	20	19.5
28	Institution	Professional government institution	6.142	17	5.000	12	14.5
29	Institution	Intersecting institutions synergy	6.571	6	4.142	27	16.5

From the survey result, the experts consider that all variables are important. However, in order to know the most important, and the assured to occurred, this can be seen from the distribution on the importance axis, and the assurance axis. Therefore, the ranking was completed to show which ones are in the 'important and feasible category', and which ones are in the 'important and should be cautious' category. The top five variables in the important and feasible category include: the invention of the appropriate technology, intervention executor creativity is aligned with the needs of F-SMEs, the management competency of supporting human resources in the execution of the IPPT program, chief commitment, and appropriate technology for functionality. Meanwhile, the crucial assumptions

that should come to our attention, in order to be feasible, include: the competency of researchers who innovate the appropriate technology; business processes, according to the provision of technology commercialisation; professional human resources, promotional proficiency of the technology transfer program; and an accessible partnership system for the technology transfer program.

Comparison Conceptual Model with the Real World

In this step, the comparation was made to test the conceptual model result against the situation in the real world. The testing was performed through in-depth interviews with experts to verify and validate the model. The analysis was undertaken as follows. In the real-world condition of the GITTP, the synergy among the institutions that show a commitment towards the F-MSEs was yet to be seen. In the conceptual model, the synergy among the institutions which have the same interest towards the F-MSEs, have shown that it is a crucial issue. The Ministry of Research and Technology - National Agency for Research and Innovation (MRT-NARI) is an institution that has an important role as the driving power for the other related institutions. IIS should produce program regulation, incentive regulation, developing the task and regulation related to the GITTP. There are two sub-divisions of the IIS that oversee the GITTP: the CUIST, and RDNPT. The CUIST will apply the incentive regulation from IIS and perform a collaboration upon the GITTP. The RDNPT generates research of appropriate technology that is intended for F-MSEs to improve their product innovation performance. Apart from this institution, a cross agency collaboration is also required. The regional governments that have an interest in achieving food security in their region, may collaborate with the RDNPT to develop a regional science and technology program that promotes the appropriate technology intended for use by F-MSEs. In this conceptual model, we can see other institutions and/or government ministries that share an important role, which are: The Ministry of Cooperatives and SMEs, the National Agency for Food and Drug, and the National Standardisation Body of Indonesia. They play a role in developing government regulation that is integrated with the GITTP, perform testing on the quality of food, and make licensing for product safety, so subsequently, the result of product innovation can be declared feasible to be consumed. This license is also important for F-MSEs in expanding their market and can be exported abroad. Partnerships with the private sector and funding institutions that have a commitment and concern towards the growth of F-MSEs are also needed.

Recommendation for Possible Desirable and Feasible Change

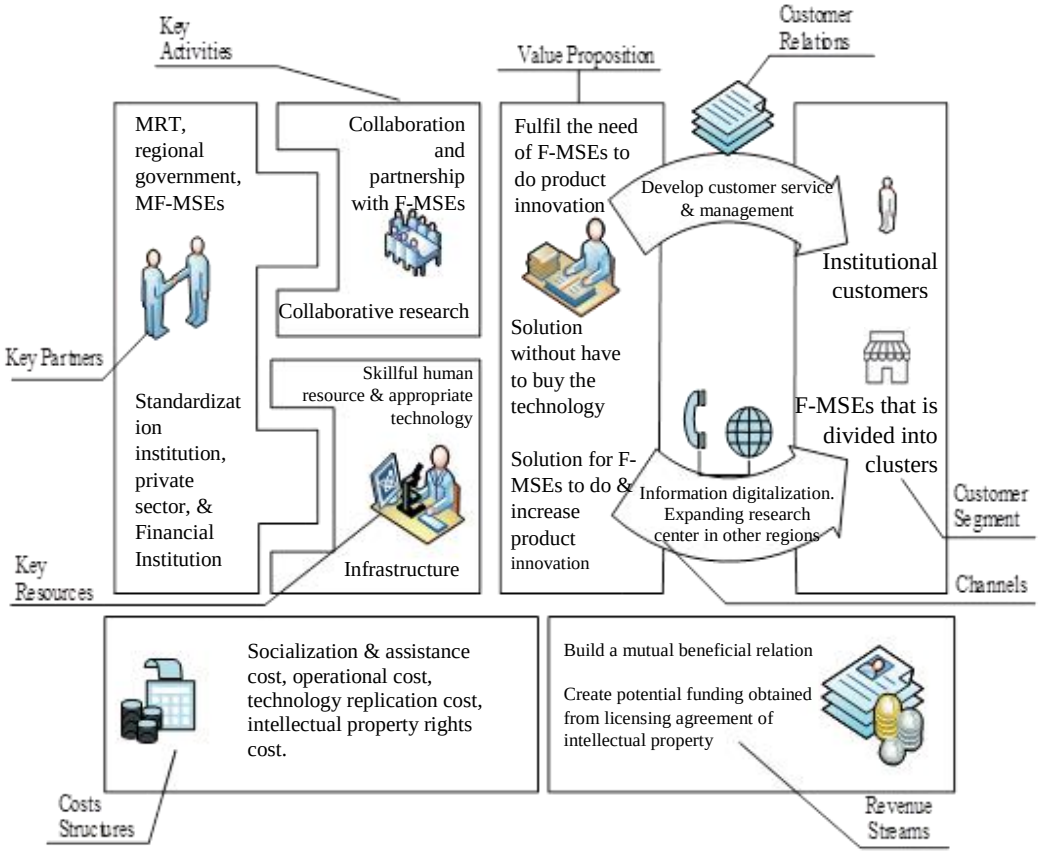
There are several activities required to implement and operate the model of government intervention upon the technology transfer program for F-MSEs to increase the product innovation effectively. In this research, we used a BMC. The BMC will help the GITTP management and actors to maintain the program continuity because it looks from a business view, while still focusing on its value proportion towards the customers.

The business model is the rationale of how an organisation creates, delivers, and pictures value, which are all represented by the BMC (Tokarski et al., 2017). The details of the activities are contained in the nine block diagrams, as follows. Firstly, the value proposition. The program should be enhancing

the services by giving comprehensive solutions with regard to the innovation capacity of MSMEs-FI. In addition, to increase collaboration with other agencies, such as the licensing agency, National Agency of Drug and Food Control, Standardisation Agency, Monetary Agency Enhance, and open partnership possibilities with third parties that also have programs for food MSE expansion. Hence, researchers can develop their research and find appropriate technological solutions that meet the needs of MSEs-FI. Secondly, customer segments. This includes: expanding the socialisation of the GITTP; reaching out to institution that have an interest with F-MSEs; and a food MSE classification service strategy, according to the cluster (micro enterprises-dry food or micro enterprises-wet food or small enterprises-dry food or small enterprises-wet food). As well as more intense socialisation to F-MSEs that they are able to perform product innovation, without inventing the technology beforehand. Thirdly, channels. This comprises strengthening the service within the administration and information sections by making a website and/or portal for the GITTP to open the information access and expand partnership opportunities with both customers, and related institutions.

The various uses of social media have helped connect the RDNPT IIS with candidate F-MSEs that require technology transfer, and related institutions. Fourthly, customer relations. Specifically, a MoU or partnership agreement with companies/institution that have interest with F-MSEs. Fifthly, revenue stream. This embodies maintaining the continuity of the GITTP by building a mutual beneficial relation. Whereas, if the researcher continues exploring the problems that will always be faced by F-MSEs, it will create an invention that will be useful for both sides; for F-MSEs through a technology solution, and for the researcher through a research result of appropriate technology. In addition, developing a partnership with related institutions or third parties. This will open a chance to perform technology commercialisation and licensing. F-MSEs introduced by the third parties can be encouraged to complete an independent technology adoption or with funding mechanism from third party. Sixth, key Activities. This includes collaboration and partnership with F-MSEs, a coordination and incentive regulation system via training and certification, as well as alignment and supporting collaborative research, and technology dissemination. Seventh, key resources. This embodies arranging training and certification for the human resources involved in the GITTP, including teamwork training to eradicate egocentric attitudes. As well as a policy from a parent institution (IIS) which supports the dissemination and/or technology transfer to MSE, as part of the implementation and/or applied research. Eighth, key partnerships. This may include managing partners, such as the Ministry of Research and Technology, the regional government, MF-MSEs, the managing partner from the Indonesia Agency of Drug and Food Control Network, standardisation institutions, private sector bodies, and fintech/avails. Ninth, and lastly, cost structure. That is, the cost for socialisation and assistance, operational cost of technology transfer by MF-MSEs, technology replication cost from MF-MSEs, cost for intellectual property rights, and technology valuation of the Centre of Utilisation and Innovation of Science and Technology. Moreover, the budgeting scheme for research supporting the problem-solving of the food industry and incentives. This mapping can also be seen in Figure 12 below.

Figure 12. Business Model Canvas Approach Mapping for Possible and Feasible Change



Conclusions and Recommendation

The conceptual model, as the result of this study has been compared with real situation as shown in rich picture, is valid and able to overcome the important issues that require the attention of GITTP. A thematic intervention is suggested, as it will provide F-MSEs access to a technology diffusion program, according to the needs of each cluster. There are four clusters which were formed based on their business scale and product characteristics, which are: food micro enterprises - wet product, food micro enterprises - dry product, food small enterprises - wet product, and food small enterprises - dry product. The potential desirable and feasible change were mapped by using the BMC approach, to maintain the program continuity and able to focus on its value proportion towards customers. The recommendation of this study is to explore deeper research for the establishment of an operational strategy, and its implementation.

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