

The Role of Pentahelix's Effective Collaboration in Developing the Frugal Innovation Strategy for the “Pekarangan Pangan Lestari (P2L)” Program

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ABSTRACT

The purpose of this study is to examine the role of pentahelix in the relationship between frugal innovation strategies and the business performance of the Pekarangan Pangan Lestari (P2L) program actors. This research design uses explanatory research with a quantitative approach. Data were obtained from the actors of the P2L program in Malang Regency. This study uses an online survey by sending a questionnaire to a group of the P2L program. The data collected and can be analyzed is 62 data. Data analysis in this study used descriptive analysis and SEM-PLS. The results show that pentahelix collaboration becomes a moderator in improving and strengthening frugal innovation strategies to produce the optimal performance of P2L program group members. Through several stages of frugal innovation which include empathizing, defining, ideating, bricolage, prototype, and testing combined with pentahelix collaboration, it is hoped that the managers/members of the P2L program group can improve their performance. This study provides empirical evidence of the use of the frugal innovation strategy and pentahelix collaboration implemented in the P2L program in solving problems of economic dynamics, providing employment opportunities due to COVID'19 as well as meeting nutritional needs to overcome stunting and overcome food insecure villages.

Keywords: Frugal Innovation, Pentahelix Collaboration, Performance, “Pekarangan Pangan Lestari” (P2L) program

1. Introduction

The COVID-19 pandemic has become a major threat to various aspects of human life. The world organization in the field of food security (FAO), health and nutrition (WHO) stated that the COVID-19 pandemic harmed nutritional intakes such as cases of malnutrition, stunting, overweight, and anemia in pregnant women (Pamungkasih et al., 2021). In addition to the health aspect, the sector that was most shaken was MSMEs (OECD, 2020), due to lower capital reserves, fewer assets, and lower productivity than large companies (BPS, 2020).

Malang Regency is one of the areas that has been designated as a priority area for handling stunting since 2018. The East Java Provincial Health Office reported that stunting under five in Malang Regency in 2020 was 12.7%. This shows that stunting in Malang Regency remains a problem in the health sector because even though it is below the WHO threshold of 20%, the stunting prevalence rate in Malang Regency is still above the overall stunting prevalence of East Java, which is 12.4% (Islami & Khourouh, 2021). Malang Regency has 87 food-insecure villages and 50 stunting villages. This food insecure village problem must be resolved to realize an independent village and reduce the food insecurity status from 87 villages or 22.3% which has been carried out since 2018 to 15% in 2024 (Suryo, 2021). In addition, the COVID-19 pandemic has reduced the number of MSMEs in Malang Regency as of July 31, 2020, to 425,000 so it has had a big impact on the economy (Fizriani, 2020). There were 247 workers laid off and 2,359 workers from 15 companies had to be laid off (Faruq, 2020), resulting in a spike in unemployment from 3.82% to around 5% (Toski, 2020) and poverty from 9.47% in 2019 to 10.15% in 2020 and 10.51% in 2021 (BPS Malang Regency, 2022).

Given that the effects of the COVID-19 pandemic on health and food are quite precarious, the goals of reducing stunting rates and increasing food security may be difficult to achieve. In this

situation, the COVID-19 pandemic has become a momentum for Malang Regency P2L managers (175 groups) to optimize their role in reducing the impact of the COVID-19 pandemic because it has been proven to increase income (Akbar et al., 2018; Ihya & Hijri, 2020). Previous findings showed that a decrease in income and a low income had a 2.5 times chance of causing a family to have stunted children (Islami & Khourouh, 2021).

Previously, the existing P2L conditions had not accommodated the right strategy and its effectiveness in times of crisis. Therefore, any organization including P2L program actors must rearrange strategies to accommodate the impact of COVID-19 (Kraus et al., 2020; Rapaccini et al., 2020) and the crisis (Cucculelli & Peruzzi, 2020; Mayr et al., 2016). Effective P2L strategies and management can provide solutions to the problems of unemployment and poverty due to COVID-19 while empowering and increasing the role of P2L in providing added value and increasing income while increasing food security and independence and helping to reduce stunting rates by fulfilling family nutrition. Therefore, this study aims to: 1) examine the effect of frugal innovation strategy on P2L program business performance and 2) examine the role of pentahelix collaboration in moderating the effect of frugal innovation on P2L business performance. The pentahelix collaboration is increasingly important during the COVID-19 pandemic so that the efforts of P2L program actors in providing added economic, social and environmental value and efforts to increase food security and independence and help reduce stunting rates by fulfilling family nutrition can be realized.

1.1 Frugal Innovation and Performance

Frugal Innovation is often used in developing countries (Pansera & Owen, 2015; Radjou & Prabhu, 2015; Prabhu et al., 2017). The needs of the poor become the starting point in implementing frugal innovation and working backward to create an innovation in the environment with scarce resources to add value and create new products. Frugal innovation is a practical solution by utilizing minimal resources to solve problems by making low-cost and quality products so that they are easily affordable by the community (Radjou & Prabhu, 2015; Woolridge, 2010).

The main trigger for the emergence of frugal innovation is that society is faced with resource constraints to achieve the basic goal of meeting unmet needs. Apart from resource constraints, developing countries have the advantage of skilled labor, low capital costs, and a persistent spirit that triggers the innovation of quality products at low prices (Prahalad & Mashelkar, 2010; Iyer et al., 2006). People in developing countries are believed to have the right skills to establish frugal innovation (Prabhu et al., 2012).

Frugal innovation is used to create faster, better, and cheaper solutions by utilizing minimal resources (Prabhu et al., 2017). Frugal innovation must be accessible, affordable, and available to the community, especially in disadvantaged areas (Prahalad & Hart, 2002). Frugal innovation is one solution that helps people in vulnerable areas, especially during the pandemic, and is expected to affect the socio-economic development of the bottom pyramid due to the democratizing effect of frugal innovation. (Mishra, 2021).

H1: Better frugal innovation improves the performance of P2L activities.

1.2 Pentahelix Collaboration and Performance

The concept of pentahelix is understood as a combination of five interrelated and synergized parties in the development of innovation. The concept of pentahelix originally came from the Triplehelix Theory which believed that the strong relationship between Academics, Government, and Business would encourage innovation both scientifically and economically (Etzkowitz & Leydesdorff, 1998). Subsequently, it developed into a Quadruple Helix with the addition of a medium as the 4th helix (Ivanova, 2014; Leydesdorff, 2012; Carayannis &

Campbell, 2010) then developed again into a Penta (Quintuple) Helix. (Carayannis et al., 2012; Halibas et al., 2017) with the addition of the community as the 5th helix (Awaluddin et al., 2016; Sudiana et al., 2020).

The lack of resources encourages the emergence of a frugal attitude, and therefore a collaborative approach is needed to design optimal solutions (Sardana, 2011). If the stakeholders of Pentahelix work together synergistically, it will foster innovation and an innovation-based economy. Through cooperation, entrepreneurs can improve organizational performance, because they have new ways to compete in the business environment (Le Roy & Czakon, 2016; Ritala et al., 2014).

H2: The better pentahelix collaboration improves the performance of P2L activities

H3: The better pentahelix collaboration strengthens the impact of frugal innovation on the performance of P2L activities

2. Methods

This research is explanatory research with a quantitative approach. Data were obtained from the management/members of the P2L program group in Malang Regency. This study uses an online survey by sending a questionnaire to the P2L group. The data collected and can be analyzed is 62 data. The determination of location delineation considers Malang Regency as the locus of stunting handling and the number of inactive P2L (more than 50%). The measurement scale uses a 7-point Likert scale. Several stages were carried out in formulating frugal innovation including empathize, define, ideate, bricolage, prototype, and test. Data analysis in this study used descriptive analysis and SEM-PLS.

3. Results and Discussion

3.1 Result

Following the existing conditions in Malang Regency, the existence of the P2L program is not only a basis for food security but is expected to solve the problems of economic dynamics, provide employment opportunities affected by COVID'19 and meet nutritional needs to overcome stunting and overcome food insecure villages. This is a reference for surveying to see the extent of the impact of the P2L program during the Covid-19 pandemic. The survey of P2L Groups was conducted with 62 P2L members as respondents.

Table 1. Profile of Respondents

No	Respondent Profile	Percentage
1	Respondent's Age	
	< 30 years	11.3
	30-39 years	12.9
	40-49 years	53.2
	50-59 years	21.0
	≥ 60 years	1.6
2	Respondent's Job	
	Housewife	41.9
	Private sector employee	8.1
	Teacher	17.7
	Service	6.5
	Village Apparatus	4.8
	Trader	6.5
	Farmer	9.7

	Self-employed	4.8
3	Education	
	Elementary School	4.8
	Junior high school	17.7
	Senior high school	45.2
	Diploma	4.8
	Undergraduate education	27.4

From Table 1 it can be seen that the respondents in this study were 4.8 percent male and 95.2% female. 66.1% of respondents have an age range of 30-49 years. There are still relatively few P2L members under 30 years old because, in that age range, young families tend to be busy working. From the aspect of education level, 45.2% have a high school education and the equivalent, 17.7% of respondents have a junior high school education level and the equivalent and 27.4% of respondents have an undergraduate education level. The level of education is a reflection of the respondent's capacity to make strategic decisions and equips P2L group managers/members to utilize their knowledge, skills, and experience in developing P2L activities.

Table 2. Profile of P2L Activities

No	Profile	Percentage
1	Membership in the P2L Group	
	<1 year	3.2
	1- 2 years	56.5
	3 - 4 years	21.0
	5 years	19.4
2	Income/month	
	100,000	25.8
	>100,000 – 250,000	21.0
	> 250,000 – 500,000	16.1
	> 500,000 – 1000.000	24.2
	> 1,000,000	12.9

Table 2 illustrates that the majority of respondents have been members of the P2L program between 1-2 years (56.5%), followed by 3-4 years, 21%. The description of the length of time being a member of the P2L program shows that the development of membership during the last 4 years has grown significantly as evidenced by the percentage of the length of business up to 4 years reaching 80.7%. This means that in the last 4 years, P2L has been able to attract people's interest and become one of the choices that people in Malang Regency are engaged in. From the aspect of monthly income, the P2L program can provide fairly even income from various income levels with the largest income being 100,000 (25.8%), > 500,000-1,000,000 (24.2%), and > 100,000-200,000 (21%).

Furthermore, to determine the quality of the data obtained, it is necessary to test its validity and reliability. In this case, the outer loading value is used to test the validity of this study. Overall, the value of the outer loading of each indicator on the three variables used is greater than 0.70. Next Table 2 also shows the AVE value of each variable more than 0.50. Referring to the two assessments, conclusions can be drawn if all the instruments used are valid.

Table 3. Validity and Reliability Test Results

Variable	Cronbach's alpha	Composite reliability	The average variance extracted (AVE)
Frugal Innovation	0.953	0.957	0.729

Performance	0.969	0.973	0.787
Pentahelix Collaboration	0.982	0.983	0.649

Then to complete the validity test, a reliability test was carried out using the Cronbach alpha value and composite reliability. The test results in Table 4 show that the value of the two tests is more than 0.70, meaning that all questionnaire instruments are reliable. Another validity test is the discriminant validity test using the Heterotrait-Monotrait Ratio method. Henseler et al. (2015) stated that the Heterotrait-Monotrait Ratio value should be less than 0.85. Table 4 presents the HTMT value of all variables in this study as less than 0.85 so it can be concluded that the research instrument is valid. Based on the tests that have been carried out, it can be concluded that all indicators measuring each latent variable are valid and reliable because the value of each test is more than the minimum limit.

Table 4. Discriminant Validity Test Results

Variable	Heterotrait-monotrait ratio (HTMT)
Performance → Frugal Innovation	0.702
Pentahelix → Frugal Innovation	0.830
Pentahelix → K performance	0.805
Pentahelix x Frugal Innovation → Frugal Innovation	0.106
Pentahelix x Frugal Innovation → Performance	0.067
Pentahelix Pentahelix x Frugal Innovation → Pentahelix	0.268

Furthermore, to test the proposed hypothesis, it is carried out by testing the structural model using the R2 value of each latent variable (Ghozali & Latan, 2015). The value of R2 shows how much the model construct is explained by the variance of the exogenous variables.

Table 5. R-Square Test Results

Variable	R-square	R-square adjusted
Performance	0.695	0.679

Table 6. Hypothesis Testing Results

Variable	Original samples	T statistics	P values	Conclusion
Frugal Innovation → Performance	0.046	0.350	0.726	Not Supported
Pentahelix → Performance	0.824	7.395	0.000	Supported
Pentahelix x Frugal Innovation → Performance	0.244	3.885	0.000	Supported

Table 6 presents the results of testing the research hypothesis. Frugal Innovation's direct effect on performance has an original value of 0.046 with a p-value of 0.726 which means it is above 0.05 so the decision is to reject the hypothesis, meaning that Frugal Innovation has no significant impact on performance. The better Frugal Innovation the managers/members of the P2L group have not been able to improve the performance of P2L activities.

Furthermore, regarding the effect of pentahelix collaboration on the performance of P2L activities, the original sample is 0.824 and is positive, meaning that the two variables are positively related. The p-value of 0.000 is less than 0.05 so the decision is to accept the

hypothesis, meaning that pentahelix collaboration has a significant impact on performance. The better the pentahelix collaboration, the better the performance of P2L activities.

In the third hypothesis, namely the moderating effect of pentahelix in the relationship between frugal innovation and the performance of P2L activities, the original sample is 0.244 and is positive, meaning that the two variables are positively related. The p-value of 0.000 is less than 0.05 so it can be concluded that the hypothesis is accepted. The better Pentahelix will strengthen the relationship between frugal innovation and the performance of P2L activities.

Table 6 also shows that the role of pentahelix collaboration as a predictor is greater than the moderating role. This means that pentahelix collaboration does not only play a role in strengthening the relationship between the two but is very much needed in improving the performance of P2L programs.

3.2 Discussion

The main trigger for the emergence of frugal innovation is that society is faced with resource constraints to achieve the basic goal of meeting unmet needs. The impact of limitations and the absence of land and other resources has resulted in the community being faced with a situation of food insecurity and has even become one of the causes of stunting. The lack of resources encourages the emergence of a frugal attitude, and therefore a collaborative approach is needed to design optimal solutions (Sardana, 2011).

One form of frugal innovation can be done through the P2L program. This program seeks home gardens as a sustainable source of food to increase availability, accessibility, utilization, and family income through a market-oriented food supply. The presence or absence of yards in residents' homes is not an obstacle in this program, residents are given the choice of planting media to be planted directly in their yards, which can also be planted on limited land, with vertical plant and hydroponic media. The development of the P2L program will provide added value to the environment because it combines creativity with the reuse of waste generated by the community.

Environmental conservation is practiced in real terms by reusing used goods to be used as a medium for planting organic plants. The development of the P2L function is not only part of efforts to improve food security, but also has an impact on the growth of social capital from the community who are members of the P2L group. Intense interaction, not only unites the community, but it can also improve skills in cultivating plants, by utilizing used goods as planting media.

In addition, the development of the P2L program also provides an added value not only for the environment because it combines artistic creations with the reuse of waste generated by the community, but also economic added value. After all, the products produced have an impact on reducing expenses while increasing people's income. The harvest on P2L land for residents that can be sold to MSME partners engaged in the food sector also improves the quality of community consumption with vegetables and garden products that are organic, and pesticide-free while supporting the national stunting reduction program by fulfilling balanced nutrition for children.

Efforts to broadly develop a frugal innovation strategy in P2L programs with a limited nature require collaboration with other stakeholders. The forms of synergy that can be carried out by various stakeholders include: 1) the private sector can assist in the form of corporate social responsibility and assistance for activities and seed assistance; 2) Academics and researchers can contribute in the form of technology transfer, dissemination of the results of Tridharma activities and assist; 3) The community can contribute in the form of being directly involved in program replication and local champions; whereas 4) The central and regional governments can replicate in all regions, conduct program development to become independent, provide assistance facilities, provide assistance and provide funding assistance both from APBN and

APBD I and APBD II. The pentahelix collaboration allows P2L program actors to obtain resources that would otherwise be impossible to obtain. Collaboration allows them to engage with different types of stakeholders, resulting in creative economic, social, and environmental efforts.

4. Conclusion

Following the existing conditions in Malang Regency, the existence of the P2L program is not only a basis for food security but provides many benefits, including 1) added value for the environment because it combines artistic creations with the reuse of waste generated by the community. 2) economic added value because the products produced have an impact on reducing spending while increasing people's income, and 3) improve the quality of people's consumption with vegetables and garden products that are organic, and free of pesticides while supporting the national stunting reduction program.

In addition, the sustainable P2L program will have a social impact in the form of increasing community cohesiveness. This study is expected to provide empirical evidence of the use of the frugal innovation strategy and pentahelix collaboration in the P2L program which is expected to solve the problems of economic dynamics, employing due to COVID'19 while meeting nutritional needs to overcome stunting and overcome food insecure villages.

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