A Pentahelix model approach: Creating Vilage Innovation Perception in Sokaraja Village Banyumas

ABSTRACT

The development of village innovation has become unsustainable, and the financial support provided by the government each year has become less effective in driving innovation. This study aims to identify the factors influencing village innovation development from the community's perspective. The research was conducted in Sokaraja Village, Banyumas Regency, where two sub-tofu business group were selected: Tofu business group A, which has village assets, and Tofu business group B, which does not. Data was collected through a survey of 60 respondents, 30 from each tofu business group, chosen in collaboration with the village administration. The survey, conducted between January to May 2024, explored community perceptions using the Pentahelix model, which encompasses the roles of social institutions, government programs, market support, innovation sources, and communication media, across 22 indicators. Data was analyzed descriptively using Importance Performance Analysis (IPA). Although all aspects of the Pentahelix model play a vital role in fostering village innovation, several indicators still require performance improvement. Strengthening village-owned enterprises and empowering local economic institutions is crucial to enhancing innovation efforts, with the support of the village community and assistance from external stakeholders.

Keywords:innovation, pentahelix, village, innovation

1. INTRODUCTION

The development of rural areas in Indonesia is a key focus of the government. Indonesia has 84,096 villages/sub-districts, each with unique characteristics that offer significant potential for economic growth and community welfare. To promote the participation of rural communities in development, the government allocated IDR 70 trillion in village funds for 2023 (BPS 2023). The distribution of village funds began in 2015 with an initial allocation of IDR 20.8 trillion, increasing by an average of 21.3% annually until 2023 (Kompas 2023). Poverty remains a persistent issue in rural areas, where the poverty rate stood at 12.36% in September 2022, higher than the urban rate of 7.53%. Although 44% of Indonesia's population of 275,773,774 people reside in rural areas (BPS 2023), addressing poverty remains a significant challenge. One of the critical obstacles in rural development is the ability of village communities to foster innovations that align with their local potential, particularly in poverty alleviation efforts.

Innovation, defined as a new idea or practice that addresses specific community issues (Kristiawan et al. 2018), is essential for empowering communities and engaging all relevant stakeholders. Therefore, a comprehensive approach involving all actors in the innovation system is crucial. The pentahelix model, which includes collaboration between academics, businesses, communities, media, and government, is a useful framework for driving innovation. This approach has been successfully applied in tourism development (Yasir et al. 2021), small and medium enterprises (Rosyadi et al. 2020), digital technology (Novani et al. 2022), and village community empowerment programs (Yusnita et al. 2022).

Sokaraja Village in Banyumas Regency holds significant potential for developing village innovation, particularly in its well-known sub-tofu business group. Its proximity to the urban center of Purwokerto offers greater opportunities to engage various stakeholders in fostering innovation. This study aims to

explore the community's perspective on village innovation development using the pentahelix approach, specifically focusing on examining the differences in village innovation perception between the sub-tofu business group that has received program treatment and a control group that has not. By comparing these groups, this study seeks to understand how the involvement of pentahelix model components—academics, businesses, communities, media, and government—impacts innovation outcomes (Anggara et al., 2022; 2023; 2024). The study is particularly interested in how the sub-tofu business group benefiting from the program aligns with the pentahelix approach and how this influences their innovation perception compared to the control group, which has not received the same program interventions.

This comparative analysis will provide valuable insights into the effectiveness of the pentahelix model in driving innovation at the village level and will help identify which factors contribute most to fostering sustainable innovation within village communities.

2. MATERIAL AND METHODS

This research was conducted from January to May 2024 in two sub-business group areas of Sokaraja Village, Banyumas Regency, focusing on the sub-tofu business group A and B (Figure 1).

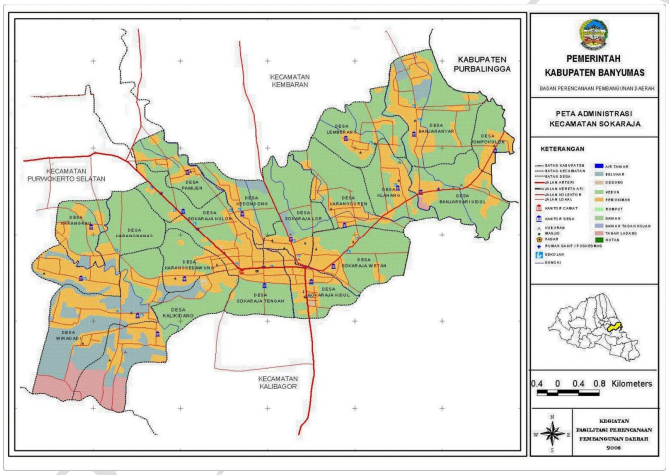

Fig 1: Study Map

These two sub-villages in Sokaraja Village are peri-urban areas where the majority of the population's economic activities are closely linked to nearby urban centers, while still maintaining traditional community activities such as agriculture. Data collection for this study was carried out through a survey involving 60 respondents. Each sub-village was represented by 30 respondents, who were deliberately chosen to represent key stakeholders, including village government officials and community leaders. The selection of survey respondents was conducted in collaboration with the village government. The variables collected covered five pentahelix components, consisting of 22 indicators (Table 1).

Table 1. Indicators Measurement

Social institutions	(1) Public awareness; (2) Community participation; (3) Economic institutions; (4) Community compliance with norms; (5) Application of technology
Government program	(1) The existence of village funds; (2) The role of Village-Owned Enterprises; (3)
Market support innovation sources	(1) Local markets; (2) Regional markets; (3)

	Marketing of superior village products Innovation sources Universities; (2) Research institutions; (3) Private companies; (4) nongovernmental organizations; (5) Local governments; (6) Innovator figures
Communication media	media (1) Interpersonal communication; (2) Communication in groups; (3) Communication with village assistant officers; (4) Communication via social media; (5) Communication via mass media

Respondents' perceptions of the pentahelix variable indicators were measured using a Likert scale ranging from 1 to 5. These perceptions were categorized into two groups: importance and performance, for all indicators related to the development of village innovation. Data analysis was conducted descriptively using Importance Performance Analysis (IPA). The measurement of both importance and performance levels is presented in Table 2.

Table 2. Importance and performance analysist guide.

	Level of importance	Level of Performance
5	Very important	Very good
4	Important	Good
3	Quite important	Pretty good
2	Not too important	Not good
1	Not important	Extremely not good

To assess the importance and performance of each indicator based on respondents' answers, the average values for both importance and performance are calculated using the following formulas: **X** represents the average performance score for the i-th indicator, and **Y** represents the average importance score for the same indicator. The formula used to calculate these averages is:

$$\overline{X} = \frac{\sum_{i=1}^{k} Xi}{n} \text{ and } \overline{Y} = \frac{\sum_{i=1}^{k} Yi}{n} \quad (1)$$

Here:

X is the average performance score for an indicator.**Y** is the average importance score for that indicator.**n** is the number of respondents.Once these averages are calculated, the Level of Conformity (LC) between the performance and importance is computed using the following formula:

$$LCi = \frac{\overline{Xi}}{\overline{Y}} \times 100\% \quad (2)$$

The **LC** value expresses how closely performance aligns with importance, shown as a percentage. The next step involves calculating the overall average values of importance and performance for all the indicators within a given variable. This is done using similar formulas:

$$\overline{\overline{Xi}} = \frac{\sum_{i=1}^{k} \overline{Xi}}{n} \text{ and } \overline{\overline{Yi}} = \frac{\sum_{i=1}^{k} \overline{Yi}}{n} \quad (3)$$

Xi is the average performance score for all indicators of the i-th variable. **Yi** is the average importance score for all indicators of the i-th variable. These average values are then plotted on a Cartesian diagram.

The **Xi** values (performance) intersect with the horizontal axis, and the **Yi** values (importance) intersect with the vertical axis. This graphical representation helps in visualizing how well the performance of each indicator aligns with its perceived importance. The diagram allows for a clear comparison between importance and performance, helping to identify areas where improvements are needed or where the performance is meeting expectations.

The indicators located in the second quadrant (Q2) require special attention, as their performance remains low despite being highly important for fostering village innovation.

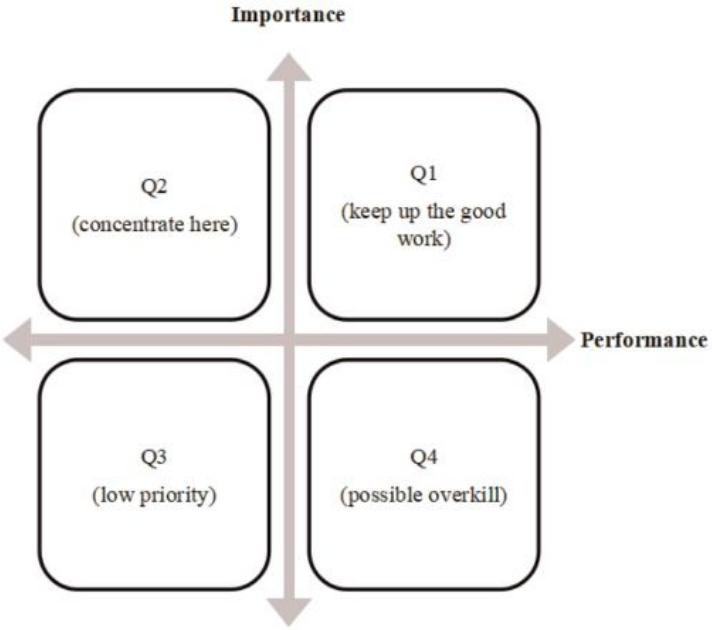

Figure 2. The IPA Quadrant

3. RESULTS AND DISCUSSION

The development of innovation in sub-tofu business group is influenced by five key variables that support innovation through the pentahelix model. Figure 3 illustrates the results of a survey on the community's perceptions of how well these pentahelix variables align with innovation development in the sub-tofu business group in the Sokaraja villages. The comparison between the level of importance and innovation performance across both areas is relatively positive, with all indicators above the 60% average. However, the level of conformity of the innovation-supporting variables is generally higher in sub-tofu business group (Treatment group) compared to sub-tofu business group A (control group), except for the support from government programs (Purnaning et al., 2024).

Among the variables, communication media shows the highest level of conformity, with 96.85% for sub-tofu business group A and 99.36% for sub-tofu business group, showing only a 2.51% difference. This indicates that the gap between the perceived importance and performance of communication media support is relatively small. Both sub-tofu business group, being close to urban areas, have good access to information and communication technology, facilitating interpersonal and group communication, communication with local officers, social media, and mass media interactions (Anggara et al., 2020; 2024; Handayani et al., 2023; 2024).

Aside from communication media, another variable with a low conformity gap is support for government programs in the village, showing 79.80% for sub-tofu business group A and 75.75% for sub-tofu business group B, with a 4.05% difference. Since 2015, the allocation of village funds has been a key factor in village development, resulting in relatively balanced levels of performance and

importance(Purnaning et al., 2024). Although village funds are not fully directed toward innovation, all work plans are prepared collaboratively during annual village development meetings. For instance, village funds were used for the construction of water infrastructure in sub-tofu business group A starting in 2021, while funds in sub-tofu business group B were allocated to support infrastructure. These activities contribute to the higher perception of government program support in sub-tofu business group A.

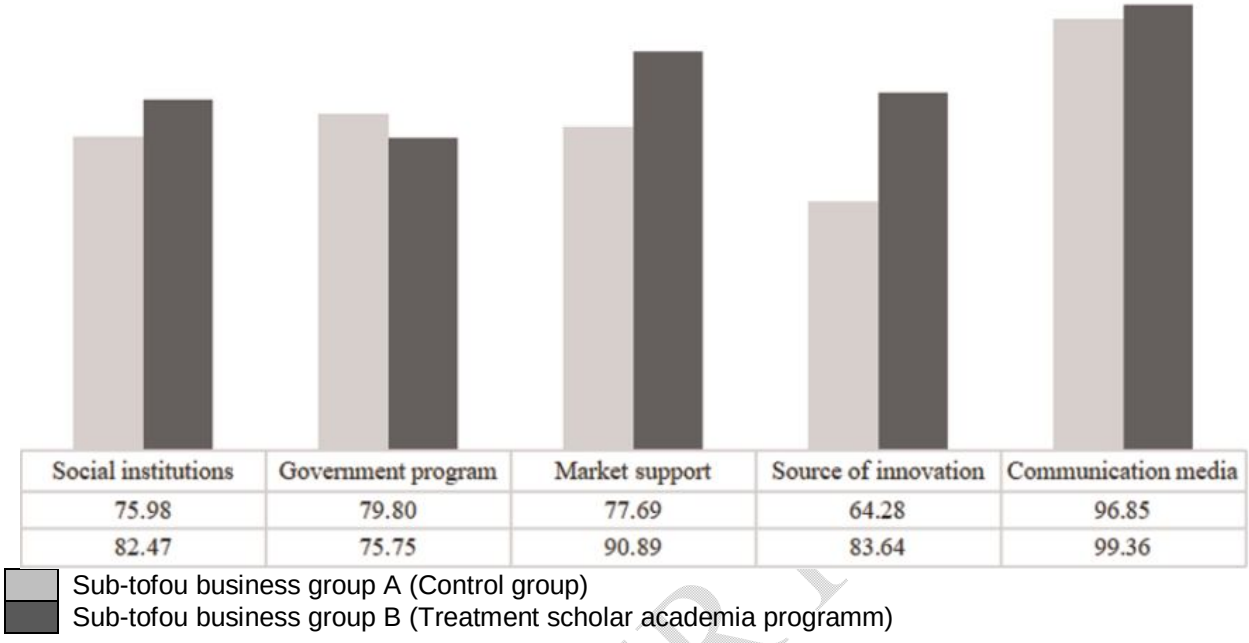

Figure 3. Pentahelix score

The social institutional variables that support the development of innovation in the sub-tofu business group B are relatively high (82.47%) because the community is accustomed to tofu production as a traditional economic activity. A strategy is needed to enhance innovation by further involving community participation. In contrast, the social institutions variable does not significantly support the development of agricultural innovation in sub-tofu business group A (75.98%) due to the lack of established institutions in the community focused on these activities. The difference in the level of innovation suitability between the two sub-tofu business group is 6.49%.

Market support for the sub-tofu business group B (90.89%) is higher than that for agricultural development in sub-tofu business group A (77.69%), with a 13.20% difference. Tofu products have a larger market potential compared to agricultural activities, as tofu is widely consumed and used in daily cooking. Meanwhile, the performance of agricultural innovation in sub-tofu business group A remains relatively low because the community's efforts to enhance this sector have only recently started.

The largest gap in variable suitability between the two sub-tofu business group is found in the innovation source variable, with a 19.36% difference. The level of suitability for innovation sources in sub-tofu business group B is quite high (83.64%) because the community can easily access various sources of innovation (such as assistance from local staff, government agencies, universities, private sector involvement, and online resources). In contrast, innovation development in Sub-village A is lower in terms of the innovation source variable (64.28%) because the community has yet to identify easily accessible sources of innovation for agricultural development.

4. CONCLUSION

The analysis of village innovation development using the pentahelix approach in Sokaraja Village focuses on improving the sub-tofu business groups by leveraging local resources. Sub-tofu business group B is focused on scaling up tofu production, while Sub-tofu business group A is still catching up. Strengthening the role of village-owned enterprises (BUMDes) and empowering local economic institutions are key indicators for boosting performance in both groups. However, Sub-tofu business group

B demonstrates better performance due to its active involvement in programs related to the pentahelix approach. This improvement proves that the sub-tofu business group receiving support from community, government, academic, private sector, and media stakeholders has achieved greater success and progress. Both internal support from the village community and external assistance from various stakeholders outside the village are essential to these processes.

The findings from this study reveal that the Pentahelix model, which involves collaboration among key stakeholders—academia, businesses, government, community, and media—plays a crucial role in fostering innovation in rural areas like Sokaraja Village. These stakeholders can achieve more significant outcomes by coordinating their efforts based on the community's needs and capacities. The government, through village-owned enterprises (BUMDes), can drive economic development initiatives that directly support innovation. By offering better access to markets and financial assistance for technological improvements, the government can enable rural entrepreneurs to expand their businesses. In particular, for local industries like the sub-tofu businesses, enhancing production methods and market access can significantly boost their ability to innovate.Academic institutions can contribute by providing technical expertise and specialized training to the local community. Universities and research institutions can work closely with local stakeholders to introduce sustainable and modern practices that improve the quality and competitiveness of village products, creating a stronger foundation for ongoing innovation. Private businesses also play a vital role in supporting innovation by offering resources, mentorship, and market opportunities to local entrepreneurs. They can collaborate with village enterprises to enhance product development, improve packaging, and develop marketing strategies that allow these businesses to reach wider regional and even national markets.Community involvement remains central to sustaining innovation. Active participation from residents can be fostered through innovation hubs and local forums, ensuring that the innovations developed are grounded in the community's real needs and have a greater chance of long-term success. This collaborative environment creates a sense of ownership among the community members, which is essential for the continued growth of innovation efforts.Lastly, media and communication channels are essential for promoting success stories and disseminating information. By sharing the innovations developed in Sokaraja Village, media outlets can inspire similar efforts in other rural areas, encouraging wider adoption of the Pentahelix model. Furthermore, communication ensures that stakeholders remain aligned in their efforts and that collaboration is maintained across different sectors.

This study provides significant insights into the role of the Pentahelix model in promoting rural innovation. However, there is a need for future research that explores the long-term impact of this approach, particularly through longitudinal studies. These studies would allow for a deeper understanding of how sustained collaboration among stakeholders influences the persistence of innovation over time.Additionally, future research should examine how continued innovation efforts contribute to the long-term economic growth of rural areas. By looking at the outcomes over several years, it would be possible to assess whether villages that implement the Pentahelix model experience greater economic stability and development than those that do not.The role of emerging technologies should also be a focal point in future studies. As technological advancements in areas such as digital marketing and e-commerce continue to evolve, their potential to enhance rural innovation could be explored in greater depth. Moreover, the influence of media and communication technologies in sustaining and scaling innovation could provide valuable insights into the mechanisms that drive rural development.Future research can comparing the results of Sokaraja Village with other rural regions could offer a broader understanding of how the Pentahelix model functions across different cultural and economic contexts. Such cross-regional comparisons would help identify the adaptability and effectiveness of this collaborative approach in fostering innovation in diverse rural settings.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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