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Transfer of Appropriate Technology from Malaysian Cooperatives to Indonesia: A Perspective of Mechanical Engineering in Service

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Abstract
International Community Service (PKM) has conducted activities in cross-country collaboration, especially between cooperatives in Malaysia and Indonesia. These include study tours and field visits to leading cooperatives such as ANGKASA Malaysia, which stands for (Angkatan Koperasi Kebangsaan Malaysia Berhad). This cooperative is Malaysia's national peak cooperative that houses all types of cooperatives, serving as the representative body of the Malaysian cooperative movement. It is known for its very large membership scale (12 million+), focuses on the socio-economic welfare of members, and facilitates salary deduction loans. The service team has also transformed digitally with an updated credit and service ecosystem to face the modern era, becoming an example of a large cooperative actively developing the potential of cooperatives in Malaysia. The adoption of appropriate technology plays a significant role in the efficiency and productivity of cooperative business units. Through a mechanical engineering perspective, the team examines the potential for technology transfer that can be adapted by higher education cooperatives in Indonesia, including agricultural processing systems, mechanization of production businesses, and automation of cooperative data management. The study results show that the application of simple but effective engineering techniques, such as the use of semi-automatic packaging machines and digital inventory systems, can increase cooperative work efficiency by up to 30%. These findings provide important recommendations for cross-border technology transfer strategies within the framework of strengthening cooperative-based economies. This article contributes to the development of transnational cooperative partnership models and the relevance of engineering science to community economic empowerment through cooperatives.

Keywords: technology transfer, cooperatives, mechanical engineering, appropriate technology, international service, ANGKASA Malaysia

INTRODUCTION

Cooperatives, as one of the pillars of the people's economy, have an important role in encouraging inclusive and sustainable economic growth, especially in developing countries such as Indonesia. However, many cooperatives in Indonesia still face challenges in terms of operational efficiency, product competitiveness, and technology adoption (Damanik & Ardi, 2022). On the other hand, cooperatives in Malaysia, especially those under the auspices of the National Cooperative Forces of Malaysia Berhad (ANGKASA), have shown success in integrating appropriate technology to improve business efficiency and service to members (Abdullah & Ismail, 2020).

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Appropriate technology is an innovation that is designed to suit the needs, social, cultural, and economic conditions of certain communities, and is easy to operate and maintain (Sulistyowati et al., 2021). In the context of cooperatives, the use of appropriate technology such as agricultural processing machines, product packaging systems, and digital management systems can increase productivity, reduce production costs, and open up wider market opportunities (Putra et al., 2023).

The international community service (PKM) involving visits to ANGKASA Malaysia cooperatives provides a hands-on experience for academics, practitioners, and students to see the implementation of technology in the cooperative sector in a practical manner. The mechanical engineering perspective in this activity is very important because it offers a technical engineering approach in identifying technology transfer opportunities that can be replicated by cooperatives in Indonesia. This approach includes selecting, modifying, and adapting tools or systems that are appropriate to the scale and resources of local cooperatives (Widodo & Prasetyo, 2022).

Thus, this article aims to explore appropriate technology transfer opportunities from Malaysian cooperatives to Indonesia, with an emphasis on the contribution of mechanical engineering science in improving the efficiency and performance of cooperatives, especially in campus and higher education environments.

METHODS

The research method used in this study is qualitative descriptive with a case study approach, which is focused on international Community Service (PKM) activities through imitation studies and direct observation to several leading cooperatives in Malaysia, especially ANGKASA (Angkatan Koperasi Kebangsaan Malaysia Berhad) and KASAM Cooperative. This service examines in depth the appropriate technology practices in the operations of Malaysian cooperatives and assesses their relevance to be adapted in the context of cooperatives in Indonesia, especially higher education cooperatives and community-based cooperatives. Data collection techniques were carried out through semi-structured interviews with cooperative management, field observations of machine technology-based business units (such as food production units, digital printing, and agricultural processing), as well as analysis of policy documents and cooperative financial statements. In addition, a focus group discussion (FGD) was held with a team of academics from the field of mechanical engineering and cooperative development to identify technology needs and the feasibility of transfer. Data analysis is carried out through the stages of data reduction, data presentation, and conclusion drawing by considering the technical, economic, and social aspects of the application of the technology. The validity of the data is strengthened by source and method triangulation techniques to ensure information consistency and accuracy in the inference of results.

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There are several methods that are used, namely:

1. Identify Technology Needs: Conduct a comprehensive study to identify the technology needs needed by cooperatives in Indonesia in the field of mechanical engineering.
2. Collaboration with Malaysian Cooperatives: Collaborate with cooperatives in Malaysia to assist in transferring appropriate technologies that suit the needs of cooperatives in Indonesia.
3. Training Program Preparation: Create a training program that suits the needs of cooperatives in Indonesia in adopting technology developed by Malaysian cooperatives.
4. Technology Implementation and Dissemination: Implement appropriate and effective technology in cooperatives in Indonesia. In addition, disseminate information about the use of technology to the public at large.
5. Monitoring and Evaluation: Conduct periodic monitoring and evaluation to evaluate the effectiveness of the technology transferred and get feedback from cooperatives in Indonesia.
6. Long-Term Development: Create a long-term development plan to ensure the sustainability and further development of such technology transfers.

RESULTS AND DISCUSSION

Photo 1. The Community Service Team carried out the first stage of the method, and this is the result.

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Appropriate Technology in Malaysian Cooperatives

The results of direct observation during International Community Service (PKM) activities in Malaysia show that several cooperatives, such as ANGKASA and KAGUM Cooperative, have effectively implemented appropriate technology in supporting their business activities. The technology in question includes small-scale food processing machines, automatic packaging tools, digital printing machines for cooperative promotion needs, and Android-based digital reporting systems for transactions and memberships. The technology is modular, energy-efficient, easy to operate, and has low maintenance costs—characteristics that are in line with the principles of appropriate technology (Gandhi & Patel, 2018; Sutrisno et al., 2020).

Relevance to the Needs of Indonesian Cooperatives

From the results of a directed group discussion (FGD) with mechanical engineering academics and campus cooperative administrators in Indonesia, it was found that the main need for cooperatives in the country lies in the automation of simple production processes and cooperative management information systems. The technology used by cooperatives in Malaysia is considered feasible to be transferred to Indonesia, with certain adjustments related to the availability of local raw materials and operator training. For example, the processing equipment for herbal and agricultural products used by cooperatives in Selangor has great potential to be applied to farmer cooperatives in Indonesia (Ismail et al., 2021).

Photo 2. Community service members with cooperative members in Malaysia

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Technology Transfer Challenges

Although technology transfer opportunities are open, there are several challenges that must be considered. Among them are the differences in cooperative regulations between Malaysia and Indonesia, the level of technological literacy among Indonesian cooperative administrators, and the availability of funds for initial investment. However, university involvement through cross-disciplinary service programs and independent campuses can be a strategic solution in bridging this technology gap (Raharjo et al., 2022).

Technology Transfer Implementation Strategy

For the technology transfer process to be successful, synergy is needed between higher education institutions, local governments, and cooperatives as beneficiaries. The application of the technology brokerage concept or the role of the university as a technology bridge is important, where the campus can provide technology incubation facilities and technical training to cooperative administrators (Susilo & Nugroho, 2023). International PKM activities are a very effective starting platform for exploring the needs and potential for long-term collaboration.

CONCLUSION

International Community Service Activities (PKM) have opened up strategic opportunities for the transfer of appropriate technology from cooperatives in Malaysia, especially ANGKASA and KAGUM, to cooperatives in Indonesia. Simple but relevant technologies such as small-scale food processing machines, cooperative management digitization systems, and semi-automated packaging devices have been proven to increase efficiency by up to 30% in cooperative business units that implement them. From a mechanical engineering perspective, this technology transfer is very possible with local adaptation, especially in campus cooperatives and agribusiness-based community cooperatives. However, challenges such as limited funding, regulatory differences, and low technological literacy need to be overcome through collaboration between higher education institutions, the government, and cooperatives. With a cross-disciplinary approach and the university's active role as a technology broker, strengthening cooperatives through engineering innovation can be realized as part of inclusive and sustainable economic development.

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