

SOCIALIZATION IN TECHNOLOGY EMPOWERMENT FOR INDONESIAN WORKERS IN PENANG, MALAYSIA: DEADFISH DETECTION IN AQUAPONICS AND E-GOVERNMENT FOR EFFECTIVE GOVERNANCE

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ABSTRACT

Currently, information technology plays an increasingly important role in various human needs. Insights into increasing knowledge are increasing with the wide implementation of technology. In this community service activity, the role of technology in the use of dead fish detectors in aquaponics and the implementation of e-Government applications is increasing the effectiveness of governance in the government. The activity carried out is a collaboration of lecturers from the faculty of computer science from the informatics study program and the information systems study program with Indonesian workers in Penang-Malaysia. The method used in this community service is a presentation followed by discussion and questions, and answers. To measure the interest and success of this service activity, at the end of the activity, a questionnaire was given to the participants of the activity, and the results showed that the program provided in this activity was surprisingly above the expectations, which was 91,2 % while this activity provided satisfaction to the audience of 86,7%.

Keywords: Community Services Activity, Dead Fish Detection, IT Governance, CCTV, Computer Vision.

1. INTRODUCTION

Traditional methods of monitoring fish health in aquaponic systems are often manual, labour-intensive, and prone to human error. These methods are inadequate for the early detection of dead fish, which can lead to significant losses in productivity and profitability. Recent advancements in deep learning and Internet of Things (IoT) technologies offer promising solutions to automate and enhance fish health monitoring(Reiser et al., 2022)(Cui et al., 2024)(Dutta et al., 2018)(Taha et al., 2022)(T. Shafeena, 2016). By leveraging these technologies, farmers can detect dead fish in real-time, take immediate corrective actions, and maintain the overall health of their aquaponic systems. This community service initiative aims to empower aquaponic farmers by developing and implementing a deep learning-based system for detecting dead fish (Reiser et al., 2022). The system will integrate IoT sensors(Haryanto et al., 2019)(Khaoula et al., 2021)(Vernandhes et al., 2017)(Alselek et al., 2022) and underwater cameras to monitor fish activity and water quality parameters, while a trained deep learning model will analyse the data to identify anomalies indicative of dead fish. By providing farmers with an affordable, automated solution, this project seeks to enhance the sustainability, productivity, and profitability of aquaponic systems.

The initiative also emphasises community engagement through workshops, training sessions, and pilot implementations. By equipping farmers with the knowledge and tools to use this technology, the project will foster the adoption of smart farming practices and promote sustainable agriculture. Ultimately, this community service project aims to bridge the gap between technological innovation and practical application, ensuring that farmers can harness the benefits of deep learning and IoT to improve their livelihoods.

A study by demonstrated the feasibility of automated fish activity detection in a recirculating aquaculture system, which can serve as a basis for extension to aquaponics. Additionally, a study by (Taha et al., 2022) highlighted recent advances in smart systems and IoT for aquaponics automation, as well as the role of computer vision in improving system efficiency. Despite these advances, research specifically addressing the application of deep learning for dead fish detection in CCTV-based aquaponics systems is still limited, especially for aquaponics with large numbers of living fish in clear water. Notably, these studies rely on the deployment of underwater cameras within fish tanks—a solution that, while effective, incurs high installation costs and demands intensive maintenance. As a cost-effective alternative, the use of above-water CCTV cameras for detecting fish mortality offers a more practical and low-maintenance solution, particularly for large-scale or resource-constrained aquaponic systems. This study proposes utilising CCTV footage to monitor fish activity and identify mortality events.

On the other hand, information technology plays a critical role in achieving good governance through e-government applications. Good governance is an approach to managing public and private affairs in a transparent, participatory, accountable and effective manner to achieve fair and sustainable development goals(Addink, 2019).

Digitised public services such as online document processing or public complaint systems can simplify bureaucracy, minimise corruption, and increase citizen participation. For example, digital platforms allow citizens to monitor

village budgets or report infrastructure issues directly, thereby encouraging more accountable and responsive governance (Alqooti, 2020).

These two topics illustrate how technology bridges specific needs in aquaponics and systemic challenges in governance with sustainable approaches. The integration of deep learning and e-government reflects two sides of the same coin: leveraging data and automation to solve real-world societal problems. Such cross-sector collaboration not only strengthens local economic resilience but also lays the foundation for a more inclusive and knowledge-based society

2. METHOD

The method describes the stages of the research, including the research design, research procedures, and how to test and analyze the data. In describing the research method, it must be supported by references, so that the explanation can be accepted scientifically. Authors are required to present a literature review that is primary (references to journal articles and conference proceedings) and up to date (references published within the last 10 years).

The community service activity was conducted through three main stages to ensure audience comprehension and active participation. First, presentations by two expert speakers specializing in deep learning for aquaponic systems and IT implementation for e-government. The presentations were designed interactively, using real-world case studies to accommodate participants from diverse backgrounds. The activity of workshop and socialization is shown in figure 1, and slide of presentation is shown in figure 2.



Figure 1. Workshop activity presentation of dead fish detection and IT implementation for e-government



Figure 2. The material in workshop community services activities

Following the presentations, an open Q&A and discussion session was held between participants and speakers. This stage allowed the audience to explore technical challenges, development opportunities, and potential barriers in implementing both technologies. A moderator facilitated the discussion to maintain focus and encourage idea exchange among attendees.

3. RESULTS AND DISCUSSION

The community service program targeted at Indonesian citizens working in Penang, Malaysia involved 29 respondents, with 28 providing complete and valid responses. Key findings from the questionnaire analysis include:

1. Interesting activity with audience expectations for Program Quality: 91% of participants expressed high expectations for the organizers to deliver an engaging and beneficial program. Meanwhile in reality the team's performance received an 81% satisfaction rate, indicating that most participants viewed the execution positively, although there are still things that need to be improved.
2. Community Satisfaction Levels: Before the program, 89.7% of participants anticipated satisfaction, while post-event, 86.7% reported being satisfied. This minimal 3% gap suggests that expectations were largely met.
3. Appropriate program with audience expectations: 89.7% felt the program matched their expectations, while 91.2% stated that the results exceeded their expectations, highlighting the program's success in delivering relevant and impactful content.

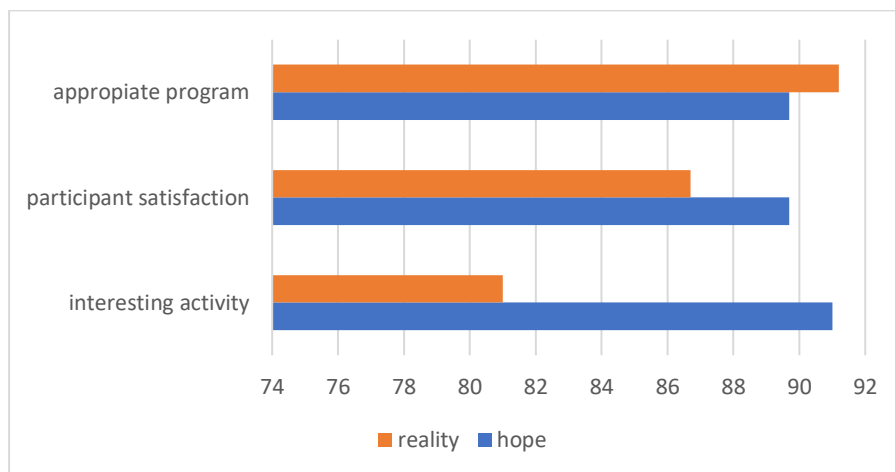


Figure 3. Questionnaire Results Analysis

The high audience expectation (91%) reflects the demand among Indonesians in Penang for community programs that are not only informative but also interactive and practical. While the team's performance was rated 81%, the 10% gap from initial expectations suggests areas for improvement in content delivery, session duration, or engagement methods.

The 86.7% post-event satisfaction rate (only 3% lower than the pre-event expectation of 89.7%) indicates the program maintained its quality. However, this minor gap warrants evaluation to better align promotional messaging with actual outcomes.

The fact that 91.2% of participants found the results exceeding expectations underscores the program's effectiveness in meeting their needs. This also confirms that participatory approaches (e.g., open discussions and questionnaires) successfully captured audience needs.

Implications and Recommendations based on the results of the questionnaire that has been given to the audience are:

1. Improve Team Performance: Focus on communication and time management training to bridge the 10% gap between expectations and performance.
2. Improve Content: Adjust the depth and duration of sessions to the specific needs of Indonesians in Penang, such as incorporating local case studies.
3. Continuous Evaluation: Establish post-event feedback mechanisms (e.g., WhatsApp groups) to monitor long-term impact.

4. CONCLUSION

The program successfully met and even surpassed community expectations, with satisfaction and relevance rates above 85%. These findings demonstrate that integrating technology topics (aquaponics and e-government) with participatory methods effectively addresses the needs of the Indonesian diaspora in Penang.

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