Bridging the Poverty Gap through Artificial Intelligence Approach: A Case of AI4EKonomi for Digital Inclusion in Malaysia

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ARTICLE INFO	ABSTRACT
	Despite the rapid advancement of Artificial Intelligence (AI) transforming global economic systems, its benefits are still not evenly distributed across societies. In Malaysia, low-income communities continue to face barriers to digital participation due to limited digital literacy, infrastructural constraints and socio-economic challenges. This study introduces AI4EKonomi, an AI-driven framework designed to bridge the poverty gap through digital inclusion and economic empowerment. Grounded in Design Science Research (DSR) and employing a mixed-method approach, the model integrates data analytics, machine learning and socio-economic profiling to deliver personalized recommendations for digital entrepreneurship, skills training and employment. Although the AI4EKonomi system is still under development, preliminary analysis and user requirement studies suggest that AI-driven recommendations have strong potential to enhance digital engagement, improve socio-economic participation and support sustainable income generation among marginalized groups. The study highlights AI's transformative role in advancing inclusive growth, aligning with Malaysia's MyDIGITAL Blueprint and the United Nations Sustainable Development Goals (SDGs) on poverty reduction and inequality. The AI4EKonomi framework offers a scalable, data-driven solution for policymakers and practitioners who are seeking to leverage AI for equitable participation in the digital economy.

1. Introduction

The technological improvement significantly improved the global view of the world. As new technology such as Artificial Intelligence, Data Mining and Internet of Things (IOT) evolved, the world become reshaping to the digital revolution that might give huge impact to the economic structures, influencing production, consumption and innovation patterns. In the economics structure, technologies have brought huge impact in term of making the process especially buying and selling efficiently and increasing part in the area of innovation in term of the product and services. In addition, the digital revolution may influence every aspect of our lives, including education, healthcare, business, and manufacturing. According to Haron *et al*., [1], the improvements in

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technologies especially from the area of artificial intelligence and data mining can empower students to learn more efficiently, effectively and contentedly. Other than that, online learning acts as a platform for learners and students and has become one of the main channels for accessing digital learning materials in a distance-learning environment [2,3].

However, this digital revolution has not benefited all societal groups equally. The digital divide in term of the gap between individuals with access to the digital technology and those without remains a persistent issue, particularly in developing economies such as Malaysia. According to the Department of Statistics Malaysia (DOSM), low-income (B40) households continue to face limited access to digital tools, low digital literacy and restricted economic opportunities. Poverty is a pervasive issue that continues to challenge global development efforts, affecting billions of individuals and obstructing pathways to sustainable progress [4].

Defined by the United Nations, poverty extends beyond merely lacking income; it encompasses insufficient access to education, food, healthcare, shelter, political representation, opportunities, security and dignity. When talking about digital revolution as long as Artificial Intelligence we assume that everybody can access these technologies but in reality, the digital transformation can't be benefited to society equally. Thus, the Sustainable Development Goals (SDGs) is a comprehensive set of goals recognizing the connections between the people and the world, in this case no poverty as mentioned in their first goal of 17s goals. While national initiatives like the MyDIGITAL blueprint aim to build inclusive digital economy implementation gaps persist in ensuring equitable access to AI-driven resources. MyDIGITAL is an initiative that represents the Government's aspirations to transform Malaysia into a digitally-enabled and technology driven high income nation and a regional lead in digital economy. The blueprint envisions Malaysia as a regional leader in the digital economy by 2030, achieving inclusive, responsible, and sustainable socioeconomic development.

1.1 AI, Recommender Systems and Digital Inclusion

A recommender system is an AI-powered filtering system that uses machine learning algorithms and user data to provide personalized suggestions for items. In data analysis recommender systems can analyze vast amounts of data, including explicit ratings and implicit interactions like clicks, views, and purchases [5]. In the part of application, they apply machine learning algorithms to identify patterns in the user behaviors and data [6]. Based on these patterns, they generate personalized recommendations to help users navigate large catalogs of content or products [7]. For example, user may have suggestions in term of products, musics, training and so forth. Previous studies have shown that the recommender system can provides tailored answer and suggestion based on the user's data. Recommender systems have shown significant potential in connecting users to resources and opportunities [7]. By applying AI-based recommendation models, socio-economic empowerment programs can become more responsive and data-driven.

Nowadays, technological advancements play a significant role in improving decision-making for individuals and society in the digital era [8]. According to Nguyen [9] digital inclusion is a form of social inclusion in the digital age that broadly refers to the concept of ensuring all individuals and communities in society have equal opportunity and ability to access and effectively use digital technologies. Besides that, digital inclusion is a critical component of sustainable e-government, ensuring equitable access to digital public services for all citizens [10]. Challenges such as limited digital literacy, infrastructural gaps, and institutional barriers hinder widespread adoption, particularly among marginalized populations [10].

Thus, this study introduces AI4EKonomi, a novel framework to leveraging AI to empower low-income communities through personalized economic recommendations. By integrating machine

learning with socio-economic data, AI4EKonomi aims to reduce poverty by connecting users to relevant skills and training, provide with digital entrepreneurship programs and income opportunities tailored to their profiles.

2. Methodology

The research approach is a mixed-methods, integrating both quantitative and qualitative methods. Data were collected through the distribution of questionnaires to 200 respondents to obtain profile data. The questionnaires collected quantitative data on socio-economic status, digital literacy levels and demographic characteristics. This study employs a Design Science Research (DSR) methodology, which emphasizes the iterative design, development, and evaluation of technological artifacts that solve real-world problems. The qualitative study investigates the design and application of an AI-based recommendation engine. It is focusing on stakeholder perspectives regarding the role in matching users with appropriate development opportunities. An expert interview was also conducted, and stakeholder feedback was used to understand how machine learning–based recommendations can align users with appropriate training, business, or employment programs.

3. Results

This section presents and analyzes the results derived from the earlier methodological approach. Table 1 summarizes the profiles of the respondents, highlighting their demographic attributes, socio-economic conditions and levels of digital literacy.

Table 1
Respondence profile

Variable	Details / Categories	Frequency (n)	Percentage (%)
Age	18–25	50	25%
	26–35	70	35%
	36–45	50	25%
	46–60	30	15%
Gender	Male	90	45%
	Female	110	55%
Education Level	Primary	20	10%
	Secondary	80	40%
	Diploma	50	25%
	Degree	50	25%
Location	Urban	120	60%
	Rural	80	40%
Income Level (RM)	<1000	60	30%
	1000–3000	90	45%
	3001–5000	40	20%
	>5000	10	5%
Employment Status	Employed	100	50%
	Unemployed	40	20%
	Self-employed	30	15%
	Student	30	15%

Variable	Details / Categories	Frequency (n)	Percentage (%)
Digital Literacy	Low	50	25%
	Medium	100	50%
	High	50	25%
Access to Digital Devices	Smartphone	180	90%
	Laptop	100	50%
	Tablet	40	20%
	None	10	5%
Internet Usage	Rarely	20	10%
	Occasionally	60	30%
	Frequently	80	40%
	Daily	40	20%

The analysis of 200 respondents' profiles shows that the largest age group was 26–35 years (35%), followed by 18–25 years (25%) and 36–45 years (25%). Female respondents slightly outnumbered males, accounting for 55% of the sample. In terms of education, the majority had secondary education (40%), while 25% held a diploma and another 25% a degree. Most respondents were from urban areas (60%) and had a monthly income between RM1000–RM3000 (45%). Employment status varied, with half being employed (50%), 20% unemployed, 15% self-employed and 15% students. Regarding digital literacy, 50% of respondents had medium-level skills, with 25% each at low and high levels. Almost all respondents had access to smartphones (90%), while 50% had laptops and 20% used tablets. Internet usage was frequent for 40% of respondents, occasional for 30%, daily for 20%, and rare for 10%. Overall, these findings provide a comprehensive overview of the socio-economic, demographic and digital literacy profiles of the surveyed population.
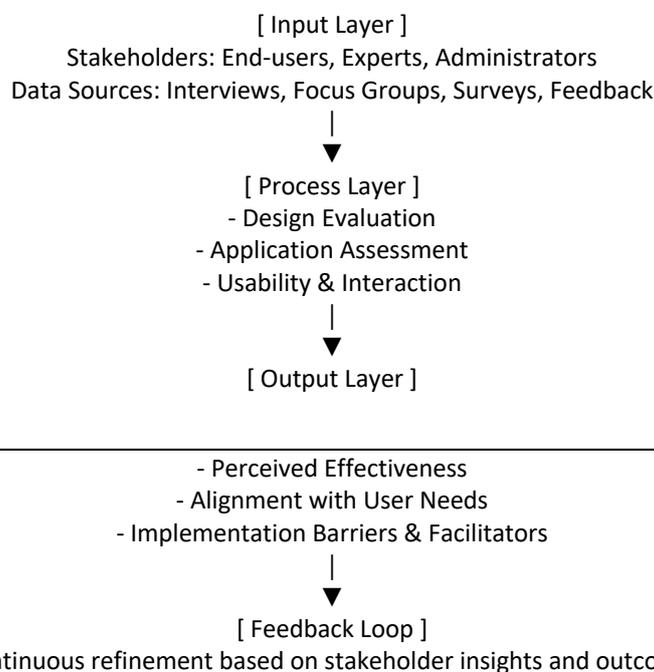
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                        [ Input Layer ]
        Stakeholders: End-users, Experts, Administrators
     Data Sources: Interviews, Focus Groups, Surveys, Feedback
                              |
                              ▼
                       [ Process Layer ]
                      - Design Evaluation
                    - Application Assessment
                     - Usability & Interaction
                              |
                              ▼
                       [ Output Layer ]
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                    - Perceived Effectiveness
                   - Alignment with User Needs
               - Implementation Barriers & Facilitators
                              |
                              ▼
                       [ Feedback Loop ]
      Continuous refinement based on stakeholder insights and outcomes
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Fig. 1. AI4EKonomi framework

Figure 1 illustrates the framework for the AI-based recommendation engine. IT shows how input from stakeholders and data sources informs the process of design evaluation, application assessment and usability analysis. The input which is then leads to outputs such as perceived effectiveness, alignment with user needs and identification of implementation barriers together with a feedback loop enabling continuous refinement based on stakeholder insights and outcomes.

4. Conclusions

In conclusion, the AI4EKonomi framework demonstrates the potential of leveraging Artificial Intelligence to promote digital inclusion and economic empowerment among marginalized communities in Malaysia. By integrating socio-economic profiling, data analytics and machine learning, the system can provide personalized recommendations for digital entrepreneurship, skills development and employment opportunities. Preliminary findings indicate that AI-driven interventions may help bridge the digital divide, enhance socio-economic participation and support sustainable income generation for low-income populations. This study highlights the transformative role of AI in fostering inclusive growth and aligns with national and global initiatives. These include Malaysia's MyDIGITAL Blueprint and the United Nations Sustainable Development Goals on poverty reduction. Further development and evaluation of AI4EKonomi will be crucial to fully realize its impact in creating equitable opportunities for all.

Acknowledgement

References
[1]   Haron, Nor Hafiza, Ramlan Mahmood, Noornajwa Md Amin, Airuddin Ahmad, and S. R. Jantan. "An artificial intelligence approach to monitor and predict student academic performance." *Journal of advanced research in applied sciences and engineering technology* 44, no. 1 (2024): 105-119.
[2]   Haron, Hafiza, Supyan Hussin, Ahmad Rizal Mohd Yusof, Hafiza Samad, and Hafidzan Yusof. "MOOC: a technology adoption using utaut model at public universities." *Test Engineering and Management* 83 (2020): 3146-3151. https://www.researchgate.net/publication/344704910
[3]   Haron, Hafiza, Supyan Hussin, Ahmad Rizal Mohd Yusof, Hafiza Samad, and Hafidzan Yusof. "Implementation of the UTAUT model to understand the technology adoption of MOOC at public universities." In *IOP Conference Series: Materials Science and Engineering*, vol. 1062, no. 1, p. 012025. IOP Publishing, 2021.https://doi.org/10.1088/1757-899X/1062/1/012025
[4]   Musaddad, Hafirda Akma, Wan Anis Wan Mohd Assrudin, and Masyitah Abu. "Poverty and The Sustainable Development Goals: A Systematic Literature Review of Their Interplay." *International Journal of Business and Technopreneurship (IJBT)* 15, no. 2 (2025): 207-218.
[5]   Felfernig, Alexander, Manfred Wundara, Thi Ngoc Trang Tran, Seda Polat-Erdeniz, Sebastian Lubos, Merfat El Mansi, Damian Garber, and Viet-Man Le. "Recommender systems for sustainability: overview and research issues." *Frontiers in big Data* 6 (2023): 1284511. https://doi.org/10.3389/fdata.2023.1284511
[6]   Ashaduzzaman, Md, and Chun-Hua Tsai. "Leveraging Generative AI to Improve Comprehensibility in Social Recommender Systems." In *Adjunct Proceedings of the 33rd ACM Conference on User Modeling, Adaptation and Personalization*, pp. 192-201. 2025.. https://doi.org/10.1145/3708319.3733696
[7]   Valencia-Arias, Alejandro, Hernán Uribe-Bedoya, Juan David González-Ruiz, Gustavo Sánchez Santos, Edgard Chapoñan Ramírez, and Ezequiel Martínez Rojas. "Artificial intelligence and recommender systems in e-commerce. Trends and research agenda." *Intelligent Systems with Applications* 24 (2024): 200435. https://doi.org/10.1016/j.iswa.2024.200435
[8]   Kannan, Rathimala, Ivan Zhi Wei Wang, Hway Boon Ong, Kannan Ramakrishnan, and Andry Alamsyah. "COVID-19 impact: Customised economic stimulus package recommender system using machine learning techniques." *F1000Research* 10 (2021): 932. https://doi.org/10.12688/f1000research.72976.1

[9]   Nguyen, Andy. "Digital inclusion: Social inclusion in the digital age." In *Handbook of social inclusion: Research and practices in health and social sciences*, pp. 1-15. Cham: Springer International Publishing, 2020.

[10]   Kraus, Sascha, Susanne Durst, João J. Ferreira, Pedro Veiga, Norbert Kailer, and Alexandra Weinmann. "Digital transformation in business and management research: An overview of the current status quo." *International journal of information management* 63 (2022): 102466.https://doi.org/10.1016/j.ijinfomgt.2021.102466