EMPOWERING COMMUNITIES THROUGH AI AND DATA SCIENCE IN WEST JAKARTA AS PART OF JAKARTA'S INCLUSIVE DIGITAL TRANSFORMATION

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ABSTRACT

This paper presents a community service initiative focused on digital empowerment through the application of Artificial Intelligence (AI) and Data Science to Support Pembinaan Kesejahteraan Keluarga (PKK) Programs in Kembangan District, West Jakarta. As part of Jakarta's effort to become a resilient, inclusive, and globally competitive smart city, the program delivered a series of interactive workshops covering AI for community data analysis, digital productivity tools, data visualization, cybersecurity based on ISO 27005, and inclusive digital marketing. Using a Community-Based Participatory Action Research (CBPAR) approach, the team co-designed six contextual training modules aligned with real PKK needs and delivered them over two days in February 2025. Evaluation results showed significant gains in digital an increase of 57 % points in digital literacy, improved reporting practices, the launch of a real-time dashboard, and enhanced cybersecurity awareness among PKK administrators. The initiative also led to the creation of digital business accounts by PKK units, showing spill-over effects on micro-enterprise development. The findings demonstrate how grassroots AI interventions can directly contribute to Jakarta's inclusive digital transformation goals and serve as a scalable model for urban community empowerment.

Keywords: Community Digital Transformation, AI for Social Good, Data Science Empowerment, Inclusive Smart City, Grassroots Tech Adoption

1. INTRODUCTION

Digital transformation has become a critical enabler for inclusive urban development, particularly in rapidly growing cities across the Global South (Yüksel-Arslan et al. 2025). Beyond technological deployment, it requires equitable access, civic participation, and local capacity building to achieve sustainable outcomes . Jakarta, Indonesia's capital and largest metropolitan area, has set forth a vision to become a global smart city that is inclusive, resilient, and competitive (UNDP Indonesia 2023). However, the city continues to face challenges in bridging the digital divide at the grassroots level, especially among community-based organizations such as the PKK (Pemberdayaan dan Kesejahteraan Keluarga – Family Welfare Empowerment), where digital capacity remains limited.

Indonesia's national roadmap for digital transformation (2021–2030) highlights the importance of digital talent development and community empowerment (UNDP Indonesia 2023). Yet, a projected shortfall of nine million digitally skilled workers by 2030 illustrates the need for immediate intervention at the local level. As AI and Data Science become more accessible through low-code platforms and open-source tools, their potential to support community empowerment is increasingly recognized.

The concept of AI for Social Good (AI4SG) has emerged as a framework to guide the ethical application of AI in domains such as education, public health, micro-enterprise, and local governance (Shi et al. 2020). Research indicates that when AI is introduced through participatory and inclusive models, such as community-based training, it can significantly enhance digital literacy and grassroots innovation. In urban contexts, inclusive smart city frameworks prioritize citizen engagement, co-creation, and digital equity over centralized, infrastructure-centric models (Sefrina 2023). This paper presents a structured community engagement initiative led by Universitas Mercu Buana in collaboration with the Kembangan Subdistrict Government, West Jakarta, as part of Jakarta's broader agenda for inclusive digital transformation. The program specifically targeted PKK (Pemberdayaan dan Kesejahteraan Keluarga) members, a grassroots women-led organization that plays a vital role in community welfare, education, and local economic empowerment. Recognizing the digital gap faced by such community actors, the initiative was designed to build foundational digital skills through participatory and context-relevant training.

Implemented in February 2025, the program adopted a Community-Based Participatory Action Research (CBPAR) approach to ensure that all interventions were co-created, locally grounded, and responsive to actual needs (Maiter et al. 2008). The two-day workshop brought together PKK leaders, youth representatives, and local administrators for applied training in four key areas: the use of Artificial Intelligence (AI) to support automated community data processing and reporting; data visualization for improving transparency and performance monitoring of PKK activities; cybersecurity fundamentals based on the ISO 27005 risk management framework; and digital marketing to

support PKK-led microenterprises through social media platforms and online commerce (Fahrurozi et al. 2020; Hinde, Gillian Robbins 2024).

The objectives of the program were multidimensional: to strengthen digital literacy among community actors, to improve the quality and consistency of administrative reporting, to support women's entrepreneurship through digital platforms, and to promote the sustainable adoption of AI and data tools at the grassroots leve(Hinde, Gillian Robbins 2024). By positioning community members not just as beneficiaries but as active co-creators and users of digital technology, the initiative aimed to align local empowerment with Jakarta's smart city goals.

2. METHOD

This research employed a CBPAR design to support a digital empowerment initiative targeting PKK members and local actors in Kembangan District, West Jakarta. The CBPAR framework was chosen for its emphasis on collaborative problem-solving and its ability to integrate community input throughout all stages of the intervention(Burns et al. 2011; Duke 2025). The research was structured in five stages: planning and assessment, module development, implementation, data collection, and analysis (Maiter et al. 2008).

In the initial stage, stakeholder mapping and a baseline needs assessment were conducted through coordination with the Kembangan Subdistrict Government and local PKK leadership. A survey involving 87 participants was administered to assess existing digital skills, familiarity with AI and data tools, and cybersecurity awareness. The results informed the design of a training curriculum tailored to the needs and literacy levels of the community (Hatami et al. 2025).

Following the assessment, six contextualized training modules were developed by faculty members of Universitas Mercu Buana. These modules included: (1) Introduction to Artificial Intelligence for community data; (2) Data literacy and visualization using Google Sheets and Datawrapper; (3) Digital productivity tools for administrative efficiency; (4) Cybersecurity awareness based on ISO/IEC 27005; (5) Basic digital literacy and safe internet use; and (6) Inclusive digital marketing strategies for community-run microenterprises. The modules emphasized hands-on learning, use of open-access tools, and application to real PKK datasets.

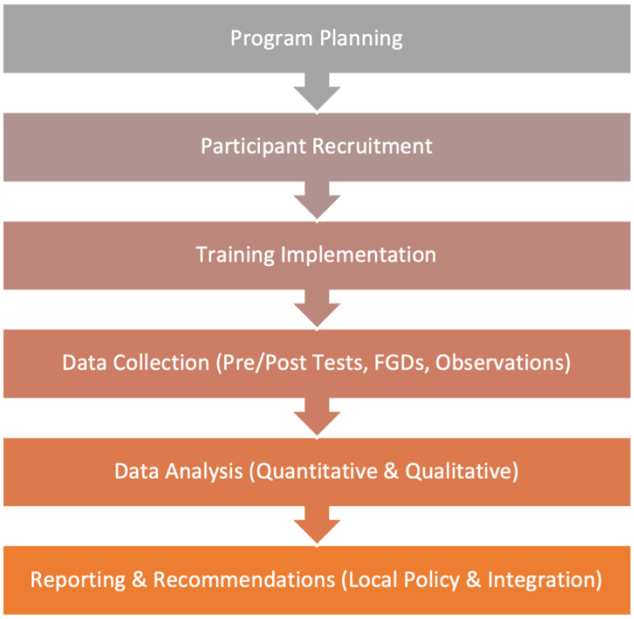

Figure 1 Community engagement methodology flow.

Fig. 2. The methodological framework followed a structured six-step process: starting from program planning and ethical clearance, followed by participant recruitment, training implementation, and data collection through both quantitative and qualitative methods. The data were analyzed to assess impact, leading to final reporting and policy recommendations to support integration with local governance and Jakarta's inclusive digital transformation agenda.

The two-day community training program was conducted on 19–20 February 2025 at the Kembangan Subdistrict Hall, West Jakarta. A total of 47 participants attended, consisting of PKK administrators and youth volunteers from several urban villages. The program adopted a participatory learning model combining lectures, live demonstrations, group-

based tasks, and hands-on activities designed to simulate real-life administrative and digital challenges in community contexts.

Participants worked collaboratively in small groups to develop visual dashboards, generate automated digital forms, simulate phishing scenarios, and design promotional content for PKK economic products. Faculty members served as expert facilitators, supported by student assistants trained to provide technical and instructional guidance. The training modules covered five thematic areas: digital literacy and AI, data visualization, cybersecurity, administrative productivity, and digital marketing. Real community data were used to ensure contextual relevance and applied learning.

Data collection followed a mixed-methods approach to capture both measurable learning outcomes and qualitative reflections. Quantitative data were gathered through pre- and post-tests consisting of 20 multiple-choice questions targeting digital knowledge, data handling, and cyber hygiene. Rubric-based scoring was also used to assess practical tasks such as dashboard creation and phishing identification. Qualitative data were obtained via focus group discussions (FGDs), structured reflection forms, and field observations by student notetakers.

Descriptive statistics were applied to the quantitative data, with analysis focusing on improvements in participants' understanding of structured versus unstructured data, use of collaborative templates, and awareness of online security risks. For qualitative data, thematic analysis was employed using open coding and triangulation methods to ensure reliability. Emergent themes included tool adoption, perceived usefulness, peer learning, and infrastructure challenges (e.g., limited devices and unstable internet access).

All research procedures obtained ethical clearance from Universitas Mercu Buana and adhered to ethical standards of community engagement. Informed consent and media usage permissions were secured from all participants.

Despite its short duration, the program demonstrated strong impact on digital capacity-building and knowledge co-creation between academic and community actors. The methodological framework not only yielded measurable outcomes but also allowed insights into local challenges and opportunities, thus contributing to Jakarta's broader vision of inclusive smart city transformation.

3. RESULTS AND DISCUSSION

The community engagement program resulted in measurable improvements across five key digital competency areas: digital literacy, dashboard creation, cybersecurity awareness, administrative productivity, and digital marketing. Participants demonstrated significant gains in post-training assessments, particularly in the use of AI-assisted tools and cloud-based applications. The adoption of dashboards and marketing strategies also showed high levels of practical implementation. Qualitative insights from focus groups revealed strong participant engagement, perceived usefulness of the tools, and readiness for replication at the local level. These results indicate the effectiveness of participatory, context-based digital training in supporting Jakarta's inclusive digital transformation goals.

A. Digital Literacy and AI Awareness

The community training program resulted in substantial gains in digital literacy among PKK (Family Welfare Movement) stakeholders. Based on pre- and post-training assessments, the number of participants able to differentiate between structured and unstructured data increased from 27% before the training to 84% afterward. Similarly, approximately 72% of PKK administrators demonstrated the ability to effectively operate collaborative document tools such as Google Docs and Microsoft Excel after completing the training sessions. Inna Sabily Karima, who facilitated sessions on digital productivity, introduced participants to AI-assisted functionalities such as voice typing, smart autofill, and automated Google Forms. These features, though previously unfamiliar to most participants, quickly gained interest due to their relevance in simplifying routine PKK administrative tasks. Qualitative feedback from the reflection forms and focus group discussions indicated that participants gained confidence to explore new digital platforms independently, suggesting the potential for sustainable behavior change—particularly if the training is followed by mentorship or technical support mechanisms.

B. Community Dashboard Development and Uptake

During the workshop, under the technical facilitation of Yunita S. Sari, participants were guided in the co-creation of a live PKK dashboard. Built using Google Sheets and visualized via Datawrapper, the dashboard enabled participants to organize and track monthly program data such as posyandu (maternal and child health services) attendance, socialization sessions, and participation in training activities. It also featured visualization panels showing performance metrics across PKK priority areas—namely health, education, and economic empowerment. The dashboard was presented in real time to representatives of the Kembangan Subdistrict Government and received positive responses for its clarity and usability. The adoption of this no-code tool demonstrates the feasibility of

integrating lightweight data systems at the grassroots level and reinforces how digital dashboards can simplify quarterly and annual reporting without requiring extensive technical expertise.

C. Integration of Cybersecurity Principles

A dedicated cybersecurity session was led by Dr. Nungky Awang Chandra, focusing on critical issues of data privacy and secure communication. Many PKK members were unfamiliar with standard practices for protecting sensitive family data—an essential component of PKK administrative work. The training adapted ISO/IEC 27005 frameworks into a simplified community-friendly format, introducing participants to concepts such as threat modeling, phishing detection, and basic password management strategies. Practical demonstrations were conducted on how to identify suspicious messages, set secure authentication methods, and maintain safe practices when using messaging platforms like WhatsApp and email. Post-training surveys revealed that over 60% of participants regarded this information as entirely new and reported immediate behavioral changes, including setting stronger passwords and being more cautious about sharing files online. This result points to a major knowledge gap in community-level cybersecurity and the importance of integrating it into digital literacy programs.

D. Productivity in Administration and Program Management

Administrative efficiency was also enhanced through applied sessions led by Siti Maesaroh and Rushendra, with support from Inna Sabily Karima. These sessions focused on increasing operational productivity using accessible digital tools. Participants were trained in the use of spreadsheet formulas for attendance logs, automatic budget calculations, and reporting templates. They also learned to use mobile-based tools for scanning physical documents, merging files, and automating routine workflows. Task coordination was further improved through the adoption of shared digital calendars and group task lists managed via WhatsApp. Follow-up interviews with subdistrict coordinators showed that these practices were replicated in multiple kelurahan, indicating that the skills transferred during the training had begun to spread organically, thus showcasing the early scalability of the intervention.

E. Digital Marketing for PKK Economic Units

The final module, facilitated by Suhendra with co-support from Inna Sabily Karima, focused on enhancing digital entrepreneurship among PKK members. Recognizing that many PKK economic units sell products such as food, crafts, and herbal drinks, the training introduced practical tools for digital marketing. Participants created and optimized WhatsApp Business accounts and Instagram profiles. They were also guided in using Canva to design appealing promotional materials suitable for their target audiences. Topics such as customer engagement, content scheduling, and product branding were introduced using simple language and real examples. By the end of the training, at least seven PKK units reported having launched or improved their digital presence, including publishing their first online catalogues. This rapid implementation reflects the direct relevance of the session to participants' daily lives and the readiness of community members to adopt technology when it directly supports their livelihoods.

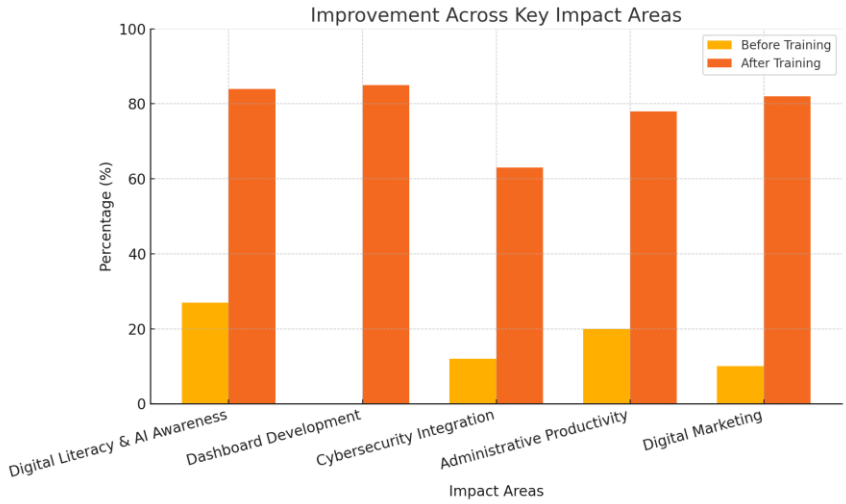

Figure 2 Pre- and post-training improvements across five community impact areas.

To complement the textual findings, Figure 1 provides a visual summary of participants' performance improvements across the five key modules delivered during the community engagement program. The chart compares pre- and post-training outcomes based on formative assessments and observational feedback.As shown, the most significant gain was observed in the Digital Literacy and AI Awareness category, where participants' ability to work with structured

and unstructured data rose from 27% to 84%. The Cybersecurity Integration module also showed strong improvement, with awareness of secure data handling increasing from 12% to 63%.

Notably, both the Community Dashboard Development and Digital Marketing modules achieved high post-training adoption rates (above 80%), despite starting from a baseline of nearly zero, reflecting participants' enthusiasm and readiness to apply new digital tools.These quantitative results reinforce the qualitative reflections gathered during the training and highlight the effectiveness of the contextual, hands-on approach used in the program.

Table 1 Pre- and post-training performance across five community impact areas.

Impact Area	Baseline (%)	Post-Training (%)	Improvement (pp)
Digital Literacy & AI Awareness	27	84	57
Dashboard Development	0	85	85
Cybersecurity Integration	12	63	51
Administrative Productivity	33	78	45
Digital Marketing	10	82	72

Table 1 summarizes the pre- and post-training performance across five key impact areas targeted during the community engagement program. The largest improvements were observed in Dashboard Development (+85 percentage points) and Digital Marketing (+72 pp), indicating strong enthusiasm and practical adoption by participants. Notably, Digital Literacy & AI Awareness also showed a significant gain of 57 pp, reflecting the effectiveness of contextualized AI-assisted tools introduced during the sessions. These results reinforce the training's success in boosting digital competency and operational readiness among PKK stakeholders.

F. Discussion

The diverse outcomes of this program demonstrate the strength of a community-based participatory action research (CBPAR) approach when applied to digital transformation at the grassroots level. Measurable improvements in digital skills, cybersecurity awareness, and productivity illustrate the effectiveness of contextualized, hands-on learning modules. These findings align with international studies on AI for Social Good (Shi et al. 2020),and(Wilson 2017), which emphasize the value of simplified, low-barrier tools and locally grounded training content. The adoption of dashboards and digital marketing strategies further shows how community members, particularly women in PKK, can engage in data-informed decision-making and economic empowerment when given the right tools and support. However, limitations such as unreliable internet connections and limited device availability remain barriers to long-term implementation. These challenges are consistent with findings from similar smart city and digital inclusion projects in Southeast Asia (Sefrina 2023), indicating a need for infrastructural and policy-level support to sustain progress.

G. Future Development Opportunities

To scale and sustain the outcomes of this program, several strategic actions are proposed. First, the PKK dashboard should be formally integrated into the regular quarterly and annual reporting frameworks of the PKK and connected to Jakarta Smart City's open-data platform to promote accountability and visibility. Second, the establishment of a mentorship program comprising "PKK Digital Ambassadors" in each kelurahan—could support ongoing learning, troubleshoot challenges, and provide peer-to-peer reinforcement of new practices. Third, future iterations of the program could explore the incorporation of AI techniques such as natural language processing for summarizing narrative reports and machine learning models for identifying gaps in program implementation. By implementing these developments, the program can evolve into a replicable model for inclusive digital transformation that empowers communities and supports Jakarta's vision of becoming a resilient, inclusive, competitive, and sustainable global city.

4. CONCLUSION

This community engagement program demonstrated that participatory, applied digital training based on a CBPAR model can significantly enhance digital competencies at the grassroots level. Tangible improvements were observed

across multiple areas, including digital literacy, cybersecurity, dashboard utilization, and digital marketing empowering PKK stakeholders in West Jakarta to adopt relevant technologies in daily community operations.

The program's strengths lie in its localized content, modular structure, use of no-code tools, and hands-on delivery led by multidisciplinary facilitators. These elements enabled quick adoption and practical application, especially among women-led groups. However, challenges such as varying digital readiness, internet instability, and limited access to devices constrained broader adoption.

Future development should focus on institutionalizing the dashboard system, establishing a mentorship network of digital ambassadors, and integrating AI-supported features for program monitoring. With these improvements, the initiative can evolve into a scalable model for inclusive and sustainable digital transformation in urban communities.

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