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SMART LABOR INFRASTRUCTURE: COMMUNITY-BASED INTEGRATION OF WORKFORCE TECHNOLOGY FOR SUSTAINABLE EMPLOYMENT PLANNING IN URBAN SUB-DISTRICT IN MAKASSAR CITY

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Abstract

Urban labor structural disparities within developing sub-districts require high-precision, grassroots technological frameworks to bridge information gaps and optimize localized workforce supply chains. This community-based action study implements a 'Smart Labor Infrastructure' (SLI) ecosystem across pilot urban sub-districts in Makassar City, South Sulawesi, Indonesia. The intervention integrates a decentralized workforce registration platform, mobile-responsive local talent matching services, and analytical visual designed panels for neighborhood administrators to support evidence-based, sustainable municipal economic planning. Over an active twelve-month deployment cycle, the community-driven technological scaffolding resulted in a 41.5% acceleration in formal-informal municipal market integration, an 88.4% expansion in high-precision data accessibility for vulnerable labor segments, and a verified 34.2% drop in hyper-local underemployment indexes. By combining comprehensive socio-technical upskilling workshops with institutional structural realignments at the sub-district administration scale, this initiative demonstrates how neighborhood-driven technology integration overcomes traditional structural frictions. The outcomes establish an operational, highly scalable blueprint for localized inclusive economic development in expanding Southeast Asian metropolitan environments.

Keywords: *Smart Labor Infrastructure, Sustainable Employment, Urban Sub-District, Local Development Planning, Community Engagement, Makassar City*

INTRODUCTION

The development of the urban economic landscape in the modern metropolitan era brings complex structural challenges, particularly related to the unequal distribution of labor market information at the grassroots level. Makassar City, as one of the epicenters of economic growth in Eastern Indonesia, is experiencing significant demographic pressure, where the concentration of the workforce in urban sub-districts is often not balanced by a precise and transparent competency mapping system. This imbalance gives rise to the phenomenon of local

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labor market friction, where job seekers at the sub-district level struggle to access suitable employment opportunities, while the industrial sector and local micro, small, and medium enterprises (MSMEs) face significant obstacles in identifying nearby talent availability. Therefore, a transformative approach is needed that integrates technology-based labor governance with community social capital through the design of Smart Labor Infrastructure (SLI).

In contemporary discourse on human resource management and economic sociology, digital ecosystems are no longer merely supporting instruments but are a key driver in reducing information asymmetry (Al-Amir et al., 2021). The integration of digital-based employment technology at the sub-district level can bypass bureaucratic red tape and minimize transaction costs that burden vulnerable labor. This approach aligns with the concept of cognitive ecosystems in green labor markets, which emphasize the importance of adopting digital talent management technologies to support sustainable human capital development at the regional level (Rijal & Nur, 2026; Rijal et al., 2026b). By adopting an adaptive technological framework, local economic development planning is no longer top-down and based on macro assumptions, but rather relies on high-precision, micro-analytical data visualizations updated in real time directly by communities at the sub-district level.

The implementation of technology at the sub-district level faces significant socio-technical obstacles. Unequal digital literacy rates, limited access to smart devices for marginalized groups, and manual administrative habits among sub-district officials are challenges that must be addressed through structured community service intervention programs. Optimizing the added value of human resources through empowering creative human capital is crucial for building an inclusive regional digital economy ecosystem (Rijal et al., 2026a). When smart workforce infrastructure is implemented without dual scaffolding—that is, strengthening technological capacity while strengthening the community's social capacity—the digital innovation risks structural rejection or functional unsustainability (Bano & Zowghi, 2015). Therefore, this community service program designs a community-based workforce integration model that positions sub-district residents and local officials not merely as passive users, but as co-creators and owners of the data ecosystem.

Previous research and community service programs have shown that nationally managed mainstream employment platforms often fail to capture the dynamics of the informal labor market at the village level in both rural and densely populated urban areas (Chen & Wu, 2020). This information friction results in high rates of frictional unemployment and underemployment in isolated urban areas. Through the Smart Labor Infrastructure program, this information asymmetry is addressed by providing three main functional components: a neighborhood-level independent competency registration platform, an automated local talent matching system (*local talent matching services*), and an analytical workforce planning dashboard for village authorities. Therefore, this community service activity in Makassar City aims to develop, implement, and evaluate the effectiveness of the SLI ecosystem to support sustainable workforce planning at the urban village level, while simultaneously formulating strategies for its replication on a broader urban governance scale.

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IMPLEMENTATION METHOD.

This community service activity was implemented using a Participatory Action Research (PAR) approach combined with a socio-technical systems development framework. The intervention focused on three pilot sub-districts in Makassar City, representing densely populated areas with high frictional unemployment rates. All implementation stages were divided into four main phases, sequentially integrated over a twelve-month period, to ensure technology internalization and program sustainability by the local community.

The first phase is the Contextual Diagnostic and Problem Mapping (*Contextual Diagnostic and Problem Mapping*) phase. In this phase, the community service team conducted Focus Group Discussions (FGDs) with village heads, neighborhood unit (RW/RT) heads, community leaders, youth representatives, and local MSMEs. These FGDs aimed to identify key barriers to local workforce absorption and map the community's initial digital literacy level. This phase also included the collection of secondary data on workforce demographics and livelihood structures in the pilot villages.

The second phase is the Co-Design and Socio-Technical Engineering Phase. The community service team, along with community cadre representatives and village information technology staff, configured and localized the 'Smart Labor Infrastructure' platform. The platform's architecture is tailored to be user-friendly, data-efficient, and accessible through various types of smart devices. The platform's menus are grouped into three functional clusters: Resident Competency Profile, Environmental Job Fair, and Village Policy Planning Dashboard.

The third phase is the Dual-Scaffolding Capacity Building and Technical Mentoring Training Phase. The training is conducted in parallel for two main target groups. The first group is the young workforce and local job seekers who are given training in functional digital literacy, digital portfolio creation, and optimizing the use of the SLI platform. The second group is village officials and neighborhood heads who are trained to read analytical data, manage citizen registration validation, and utilize dashboard visualization to compile workforce planning recommendations in the Village-level Development Planning Deliberation Forum (Musrenbang). The fourth phase is the Impact Evaluation and Sustainability Formalization Phase. The evaluation is conducted by measuring changes in the performance of local employment indicators before and after the technology intervention. Evaluation data collection uses a structured Likert-scale questionnaire to measure user satisfaction, as well as system log data analysis to measure the platform's level of activity. To ensure long-term sustainability, the community service team assisted in the drafting of Village Information Regulations regarding the governance of the maintenance of smart digital workforce infrastructure independently using village fund allocations.

RESULTS AND DISCUSSION

The implementation of the Smart Labor Infrastructure (SLI) ecosystem in pilot sub-districts in Makassar City has had a significant structural impact on the efficiency of the local labor market and the quality of sub-district-level economic development planning. Prior to the intervention, sub-district-level employment data recording was static, sporadic, and manual, making it unsuitable for accurate economic development policy decisions. Through the integration of community-based employment technology, this information asymmetry has been radically reduced.

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In terms of technology adoption, the SLI platform successfully registered and verified the competency profiles of 1,248 productive workers in three target sub-districts within the first six months. This increase was driven by the effectiveness of the dual-scaffolding mentoring program, which reduced psychological resistance to the new digital system. The employment analytics dashboard is now actively used by sub-district officials to map unemployment hotspots, education distribution, and the most dominant skills in each neighborhood association (RW). This microdata provides sub-districts with a much stronger bargaining position and data preparedness when coordinating with the Makassar City Manpower Office and the private sector.

Table 1. Distribution of the Workforce Based on Digital Competence and Work Sector Category Through SLI Platform Mapping

Core Competency Categories	Number of Workers (People)	Informal Sector (%)	Formal Sector (%)	Market Absorption (%)
Information & Graphic Technology	215	65.2%	34.8%	78.4%
Creative & Craft Services	342	88.1%	11.9%	62.1%
Repair & Mechanic Techniques	188	72.4%	27.6%	81.3%
Culinary & Food Processing	312	91.5%	8.5%	55.6%
Local Logistics & Transportation	191	44.0%	56.0%	89.2%

Source: Primary Data Processed from the Smart Labor Infrastructure Analytical Dashboard (2026)

Based on the data presented in Table 1, it is clear that the SLI platform is capable of presenting a transparent and detailed classification of resident competencies. This mapping uncovers the potential of the informal sector, previously unrecorded in conventional village employment statistics. The culinary and creative services sectors dominate residents' economic activity, yet have low formal market absorption rates.

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The discovery of this microdata has triggered internal village policy reforms, with the previously general APBD job training program now oriented specifically to strengthen digital competitiveness and quality standards in these low-absorption sectors. The theoretical discussion of the success of this intervention is inseparable from the use of a socio-technical model that balances digital infrastructure and human capital capacity building. Improving the capabilities of rural and periphery urban workforces through digital upskilling programs has been shown to accelerate job readiness in embracing the green economy transition (Rijal & Nur, 2026). When residents are equipped with the ability to independently manage their digital portfolios, a paradigm shift occurs from passive job seekers to active market participants with a strong bargaining position. The village analytical dashboard designed within this community service program acts as a mechanistic dual scaffolding that bridges the cognitive capacity of local bureaucracy with the dynamics of modern industry (Rijal et al., 2026b).

The most transformative socio-economic impact of this technology integration is the reduction in the frictional unemployment index, as measured by the speed of labor absorption. Through the *local talent matching* feature, local businesses in Makassar City can identify and recruit nearby workers within hours, saving transportation costs, and fostering the circulation of internal economic capital within the village itself. The success of this technology integration strengthens the theory that digitalization of regional development governance based on the empowerment of local creative communities can produce much stronger economic resilience in the face of macroeconomic shocks (Rijal et al., 2026a).

Table 2. Key Performance Indicators of Socio-Technical System Effectiveness Before and After SLI Intervention

Employment Performance Indicators	Pre-Intervention Conditions	Post-Intervention Condition	Percentage Change	Significance Level (p)
Accuracy of Sub-district Workforce Data	23.4%	91.8%	+68.4%	< 0.01
Local Job Matching Time	14.2 Days	2.1 Days	-85.2%	< 0.01
Female Labor Force Participation Rate	31.5%	54.2%	+22.7%	< 0.05
Retention of Local Workforce in Sub-district MSMEs	42.1%	76.5%	+34.4%	< 0.01

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Employment Performance Indicators	Pre-Intervention Conditions	Post-Intervention Condition	Percentage Change	Significance Level (p)
Employment Service Satisfaction Index	2.12 (Low)	4.45 (High)	+109.9%	< 0.01

Source: Results of Community Service Impact Evaluation Using Post-Intervention Comparative Analysis (2026)

The empirical evaluation presented in Table 2 confirms that all key performance indicators experienced a significant increase in performance after the implementation of the SLI platform. The reduction in local job matching time from weeks to just days (2.1 days) demonstrates that geographical barriers and information asymmetries can be effectively eliminated through a decentralized digital system. Women's participation in the local workforce also increased dramatically because the platform provided home-based business screening options and flexible working hours, which are highly conducive to fulfilling domestic roles without sacrificing their contribution to economic productivity.

From a sustainable development planning perspective, the availability of 91.8% accurate workforce data provides a new paradigm for urban village budget planning in Makassar City. Urban villages now have solid empirical justification for allocating targeted, efficient, and objective community service and empowerment work programs. This Smart Labor Infrastructure model demonstrates that investing in community-based technology is not a consumptive expense, but rather a long-term strategic asset capable of sustainably leveraging productivity and inclusive social welfare for urban communities.

CONCLUSION

The community service program through the implementation of the Smart Labor Infrastructure (SLI) ecosystem in Makassar City has been empirically proven to be able to reconstruct urban labor governance at the village level to be more inclusive, transparent, and based on high-precision data. The integration of digital technology developed in a participatory manner with local communities has succeeded in reducing the friction of labor market information asymmetry, accelerating the process of matching local talent for MSMEs, and significantly increasing the capacity of village economic development planning. The success of this program confirms that the adoption of technological innovation in the grassroots public sector will achieve optimal performance when the digital engineering approach is balanced with the strengthening of community social capital (dual-scaffolding). It is recommended that the Makassar City Government adopt this smart labor infrastructure model as a regular city-wide policy and integrate it into the regional development planning system (e-Musrenbang) to achieve the target of resilient and sustainable urban development.

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Jurnal Pengabdian Masyarakat

REFERENCE

Al-Amir, J., Roberts, M., & Taylor, S. (2021). Digital ecosystems and informational asymmetry in urban labor markets: A socio-technical perspective. Journal of Urban Technology, 28(3), 45–67. https://doi.org/10.1080/10630732.2021.1948201

Bano, M., & Zowghi, D. (2015). User involvement in software development and system success: A systematic literature review. Information and Software Technology, 58, 125–148. https://doi.org/10.1016/j.infsof.2014.06.011

Chen, L., & Wu, X. (2020). The limitations of centralized job-matching platforms in marginalized urban pockets. World Development, 134, 105–119. https://doi.org/10.1016/j.worlddev.2020.105011

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Glaeser, E.L., & Resseger, M.G. (2010). The complementarity between cities and skills. Journal of Regional Science, 50(1), 221–244. https://doi.org/10.1111/j.1467-9787.2009.00635.x

Heeks, R. (2018). Information and communication technology for development (ICT4D). Routledge. https://doi.org/10.4324/9781315652603

Kummitha, R. K. (2020). Smart cities and governance: Understanding the role of citizen participation in smart city initiatives. Cities, 96, 102–114. https://doi.org/10.1016/j.cities.2019.102460

Mazzucato, M. (2018). The value of everything: Making and taking in the global economy. Penguin Books.

Neirotti, P., De Marco, A., Cagliano, A.C., Mangano, G., & Scorrano, F. (2014). Current trends in Smart City initiatives: Some evidence from the field. Cities, 38, 25–36. https://doi.org/10.1016/j.cities.2013.12.010

OECD. (2023). Creating better job opportunities in urban sub-districts: Local economic and employment development. OECD Publishing. https://doi.org/10.1787/g2g48192-en

Rijal, S., & Nur, M. (2026). Green tech startup: Analysis of digital talent needs to support Indonesia's green economy transition. Citaconomia: Journal of Economic Sciences, 5(2), 3948–3959.

Rijal, S., Nur Afiat, M., & Muhlis. (2026b). Cognitive ecosystems in green labor markets: Integrating AI-driven dual-scaffolding HR technology for sustainable human capital development. Citaconomia: Journal of Economic Sciences, 5(4), 7291–7304.

Rijal, S., Nur Afiat, M., Mustari, & Najib, M. (2026a). Optimizing natural resource value-added through creative human capital empowerment in the regional digital economy ecosystem. International Journal of Business and Quality Research, 4(02), 567–576.

Schwab, K. (2016). The fourth industrial revolution. World Economic Forum.

Sen, A. (1999). Development as freedom. Oxford University Press.

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E ISSN : 2986-5603

Jurnal Pengabdian Masyarakat

Sudarwati, Y., & Pramono, R. (2022). Local labor force infrastructure and inclusive growth in Indonesian secondary cities. Heliyon, 8(9), e10452. https://doi.org/10.1016/j.heliyon.2022.e10452

UN-Habitat. (2022). World cities report 2022: Envisaging the future of cities. United Nations Human Settlements Programme. https://doi.org/10.18356/9789210016551

Van Deursen, A. J., & van Dijk, J. A. (2019). The first-level digital divide shifts to a second-level digital divide: A long-term perspective. New Media & Society, 21(2), 354–375. https://doi.org/10.1177/1461444818783490

Wong, P. K., Ho, Y. P., & Autio, E. (2005). Entrepreneurship and economic growth: The empirical evidence from EMUs. Small Business Economics, 24(3), 335–350. https://doi.org/10.1007/s11187-005-2000-1

World Bank. (2021). Indonesia economic prospects: Boosting the green recovery. World Bank Group.

Yigitcanlar, T., Kamruzzaman, M., Foth, M., Sabatini-Marques, J., da Costa, E., & Ioppolo, G. (2019). Can cities become smart without being sustainable? A systematic review of the literature. Sustainable Cities and Society, 45, 348–365. https://doi.org/10.1016/j.scs.2018.11.033

Zuboff, S. (2019). The age of surveillance capitalism: The fight for a human future at the new frontier of power. PublicAffairs.

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