JURNAL ILMU ADMINISTRSI NEGARA (AsIAN)
Volume 13 Nomor 2 (September 2025)
DOI : 10.47828/jianaasian.v13i2.290

P-ISSN : 2338-9567
E-ISSN : 2746-8178

The Surakarta Model: Implementing Knowledge-Based Economy Principles in Culturally Rich Medium-Sized Cities

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ARTICLE INFO

Article history:
Received 31/03/2025
Revised 12/02/2026
Accepted 17/03/2026

Abstract

This study explores the implementation of Knowledge-Based Economy (KBE) principles in medium-sized cities within emerging economies, with a specific focus on Surakarta, Indonesia. While scholarly attention has primarily concentrated on major metropolitan areas in developed nations, this research addresses the significant gap in understanding how medium-sized urban centers with rich cultural heritage can successfully transition toward knowledge-based development models. Through a qualitative methodological approach using document analysis, this study examines Surakarta's strategic initiatives to integrate cultural assets with technological innovation and human capital development. The findings reveal that Surakarta has achieved notable success in establishing a "creative-based knowledge city" model, demonstrating significant growth in creative industry participation and knowledge-intensive businesses. These results suggesting that medium-sized cities in emerging economies can leverage their distinctive cultural identities as competitive advantages in the global knowledge economy. The research contributes to both theoretical frameworks and practical policy formulation by proposing an adaptable model for sustainable urban development that balances economic modernization with cultural aspects.

Keywords: *Knowledge-Based Economy, Urban Planning, Emerging Economies, Surakarta*

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INTRODUCTION

The city of Surakarta, Indonesia, most frequently referred as Solo, is currently undergoing a significant change that showcases the difficulties and advantages encountered by medium-sized cities in emerging nations as they shift towards a knowledge-based economy. This move has generated differences among urban planners and economists over the viability of such a transition in communities that have traditionally depended on industrial and cultural tourism (Dian, 2023). Recent data suggests a positive direction: Surakarta's economy expanded by 5.74% in 2022,

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surpassing the national average and its Human Development Index (HDI) rose to 81.86, placing it among the leading cities in Indonesia. Surakarta is facing the urgent need to adapt to rapid technological change and globalization in order to avoid being left behind in the global knowledge economy (Muhammad et al, 2022).

The approach involves utilizing Surakarta's unusual combination of cultural heritage, growing creative sectors, and enhancing human capital to establish a unique model of urban growth based on knowledge. The city's growing startup ecosystem and the development of its higher education sector, exemplified by institutions such as Sebelas Maret University, highlight the significance of this social phenomenon in promoting innovation and research (Puspitasari & Kusumawati, 2022).

The combination of these variables creates a crucial moment for Surakarta, when effectively combining traditional strengths with principles of the information economy could reshape its economic environment and serve as a blueprint for other medium-sized towns in the Global South.

The conceptualization of the relationship between knowledge-based economies and human development has sparked debate about the direction of causality. Some researchers argue that human development is a prerequisite for knowledge-based economies (Sen, 1999), while others see it as an outcome (Florida, 2002). A transformation in this understanding is evident in more integrative approaches. Current trends show a focus on the synergy between these two concepts (UNDP, 2019). An emergency exists in the need for policies that simultaneously drive knowledge-based economies and improve human development indices.

Boni and Walker (2016) propose a capabilities approach as a solution, linking skill development with economic opportunities. This approach offers a more holistic view of development, particularly relevant for medium-sized cities transitioning to knowledge-based economies. The role of culture and creative industries in knowledge-based economies has undergone significant transformation.

Some argument exists regarding the extent to which these sectors can be primary drivers of economic growth (Pratt, 2008). Recent trends show greater recognition of the economic contribution of creative industries (UNCTAD, 2018). An emergency arises in the need to integrate cultural heritage with technological innovation. As a solution, Lazzeretti et al. (2018) propose a "creative-based knowledge city" model that combines cultural wealth with technological innovation to create economic value.

Cases such as Edinburgh (Turok, 2003) and Montreal (Duxbury, 2004) demonstrate the potential of this approach in the context of medium-sized cities. This model offers a pathway for cities with rich cultural heritage to leverage their unique assets in developing knowledge-based economies, potentially providing a competitive edge in the global market.

The necessity of adapting these frameworks to suit the particular circumstances of cities such as Surakarta is clearly demonstrated in the literature, as experts advocate for more sophisticated methods that take into account the local cultural and socioeconomic resources. Solutions proposed in recent studies include the development of context-specific indicators for measuring knowledge

economy progress in medium-sized cities (Fachinelli et al., 2015) and the application of the Triple Helix model to foster university-industry-government collaborations (Etzkowitz & Leydesdorff, 2000).

In addition, the significance of creative industries and cultural heritage in stimulating economic growth based on knowledge has become more prominent. This is exemplified by Lazzeretti et al.'s (2018) notion of the "*creative-based knowledge city*." This growing body of literature offers a strong theoretical basis for studying Surakarta's transition, while emphasizing the importance of empirical research that may connect global knowledge economy concepts with local implementation in various urban settings (Abasova, 2023).

The main aim of this study is to examine the potential and difficulties faced by Surakarta in establishing a sustainable and inclusive knowledge-based economy model that utilizes its distinctive cultural heritage and growing creative industries. This research seeks to explore the contentious issue of whether medium-sized cities in developing countries can effectively transition to knowledge-based economies. It strives to achieve this by conducting a comprehensive analysis of the case of Surakarta.

The study intends to examine the developments occurring in Surakarta's economic landscape, with a specific focus on the interaction between traditional sectors and growing knowledge-driven enterprises. An analysis will be conducted to uncover patterns and prospective trajectories in current trends of economic growth, improvement in HDI, and the development of knowledge-based sectors. The research will also focus on addressing the emergence of talent gaps and digital infrastructure shortfalls. It will propose solutions based on global best practices that are tailored to local conditions.

This study aims to contribute to the theoretical and practical understanding of knowledge economy transitions in medium-sized cities in developing nations, specifically in Surakarta. It seeks to develop a comprehensive framework for assessing and promoting knowledge-based economic development in Surakarta.

Moreover, its objective is to furnish policymakers and stakeholders with practical insights for devising and executing plans that foster economic growth based on knowledge, while also guaranteeing social inclusivity and the preservation of culture.

This research suggests that Surakarta has the capacity to create a sustainable and equitable knowledge-based economy by effectively combining its cultural legacy and growing creative industries with expanding knowledge-intensive sectors.

The main proposition is that Surakarta's achievement in shifting towards a knowledge-based economy depends on three crucial elements: (1) establishing a strong innovation ecosystem through effective cooperation among educational institutions, industries, and local government; (2) constructing digital and physical infrastructure that enables the exchange and collaboration of knowledge; and (3) enforcing policies that encourage knowledge-based entrepreneurship while ensuring social inclusivity.

This study aims to refute the contentious belief that medium-sized cities in developing nations are incapable of competing in the global

knowledge economy. It will accomplish this by conducting a detailed investigation of Surakarta's situation.

The analysis will situate global trends in knowledge-based economic development within the local context of Surakarta in order to pinpoint particular opportunities and constraints.

The research seeks to prove that medium-sized cities such as Surakarta may effectively and successfully engage in the global knowledge economy by implementing suitable policies. Additionally, it wants to showcase Surakarta as a potential role model for other similar towns in Indonesia and abroad.

CONCEPTUAL FRAMEWORK

The concept of a knowledge-based economy (KBE) has gained increasing attention as societies evolve from traditional industrial models to more information-driven paradigms. As defined by the OECD in 1996, a KBE emphasizes the significance of knowledge generation and dissemination as the principal factor of production.

This shift has fundamentally altered employment patterns, leading to both new opportunities and challenges, especially in skill requirements for the workforce (Raut et al., 2024). A KBE is characterized by the essential role of human capital, which is increasingly recognized as a backbone for sustainable economic growth (Hamed et al., 2024). The effective management of knowledge—including governance, innovation, and creativity—emerges as a quintessential factor influencing regional and national competitiveness within a KBE (Lin, 2007). Consequently, understanding the readiness of various societal segments, such as students and workers, becomes critical, as their preparedness directly impacts a country's transition towards a knowledge economy (Nagari et al., 2023).

Human capital development is pivotal in augmenting a KBE, influencing productivity and innovation. Continuous education and skills enhancement are highlighted as crucial factors driving economic progress within the KBE framework (Sultan & Kazimi, 2023). The interrelationship between education systems and economic demands underscores the necessity for policies that support lifelong learning and skill acquisition, particularly in higher education (Marcelo et al., 2024).

In light of globalization and rapid technological advancements, higher education institutions must adapt curricula to equip students with relevant knowledge and skills (Toimbek, 2022). Research indicates that universities play a vital role in creating and sustaining knowledge economies by producing a highly skilled labor force capable of driving innovation and economic growth (Pham, 2024).

Furthermore, the importance of vocational education and training (TVET) becomes evident as it aligns closely with labor market demands, ensuring that graduates are well-prepared for the evolving job landscape (Oviawe, 2020).

The role of technology, especially information and communication technology (ICT), cannot be overstated in the context of knowledge economies. Technological advancements have redefined traditional economic models, enabling new forms of knowledge creation and exchange (Peters & May, 2004). The ability of firms and regions to adapt to new technologies is crucial for achieving competitive advantages in a

rapidly changing global environment (Hadad, 2017). Organizations now prioritize investing in training and development to maintain their relevance and effectiveness in a KBE (Boulet et al., 2002).

Moreover, technological integration fosters collaboration among various industries, thereby enhancing innovation and productivity across sectors (Siddiqui & Afzal, 2022). This interdisciplinary collaboration further facilitates the efficient circulation and utilization of knowledge—a core characteristic of successful knowledge economies (Rottleb & Kleibert, 2022). By emphasizing the significant role of ICT, we glean insights into how it shapes the dynamics of labor markets and influences economic growth trajectories.

While the transition towards a KBE presents ample opportunities, it also brings about inherent challenges such as skills mismatches and unemployment (Raut et al., 2024). As traditional job roles evolve or become obsolete, there is a pressing need for workforce retraining and upskilling initiatives. Proactive measures by governments and industries are crucial in addressing the skills gap and ensuring that employees can transition effectively into new roles within the KBE (Seidl, 2022). For example, policies promoting career preparedness in educational systems are vital in preparing younger generations for future labor demands (Tran et al., 2023).

Additionally, challenges such as brain drain, particularly in developing countries, impede their progress towards a fully functional KBE (Liu, 2024). The movement of skilled professionals to more developed regions exacerbates the skills shortage in their home countries, hindering economic development (Ndulu, 2004). Addressing these challenges requires concerted efforts from all stakeholders, including educational institutions, businesses, and policymakers, to create a conducive environment for nurturing human capital.

The global landscape is increasingly marked by competitive pressures where nations strive to optimize their human capital. Countries are now more influenced by knowledge economy discourse, thus ensuring that their labor forces possess competitive skills becomes paramount for survival in the global marketplace (Krejsler, 2020). This drive has led to a renewed focus on educational reforms aimed at enhancing skill acquisition and innovation capabilities (Kettunen & Prokkola, 2021). The intersection of policy and education plays a critical role. Effective education policy can help establish a culture of innovation that is essential for fostering a knowledge economy (Barakat et al., 2021). The collaboration between academic institutions and industry is crucial in designing relevant curricula that respond to market needs (Carlaw et al., 2006).

Consequently, bridging the divide between academia and industry can accelerate the growth of a robust knowledge economy, ultimately contributing to better economic outcomes.

RESEARCH METHODS

This study adopts a qualitative research methodology to provide a systematic evaluation of *Knowledge-Based Economy* (KBE) implementation within the specific urban context of Surakarta.

Drawing upon an analytical logic that prioritizes structural coherence, the research is

operationalized through four core pillars that serve as the primary evaluative criteria: the synergy of the innovation ecosystem through Triple Helix collaborations, the integration of digital and physical infrastructure for knowledge exchange, the modernization of cultural-economic assets, and the efficacy of governance in promoting inclusive entrepreneurship.

By utilizing secondary data—including government policy frameworks, academic discourse, and developmental reports—the study assesses whether Surakarta's strategic initiatives constitute a resilient model for a "*creative-based knowledge city*".

This methodology allows for a sophisticated analysis of how medium-sized cities in emerging economies can strategically leverage local cultural capital as a competitive advantage while managing the complexities of technological transition and social equity.

RESULT AND DISCUSSION

The triple helix framework

Establishing a strong innovation ecosystem in Surakarta requires structured cooperation among educational institutions, industries, and local government that is embedded in clear regulations, shared strategies, and continuous knowledge exchange (Demartoto, 2022; Susantono et al., 2023).

The synergy of these three actors can drive research downstreaming, accelerate technology adoption, and strengthen the regional economic base through innovation-driven entrepreneurship (PPI Belanda, 2025; UMS, 2023).

In this context, the triple helix framework provides a useful lens to understand how universities, firms, and government co-evolve to produce, diffuse, and commercialize knowledge at the city level (Saparita, 2023).

Surakarta's local government has begun to institutionalize innovation through regional regulations on innovation and public sector renewal, creating a more predictable environment for collaboration (Surakarta City Government, 2024).

These regulatory instruments align with national mandates under local governance law, which require local governments to foster innovation in public service provision and development (Demartoto, 2022).

However, regulations alone are insufficient if not accompanied by organizational capacity, cross-sector forums, and incentive schemes that reward collaborative experimentation.

Therefore, building a robust innovation ecosystem in Surakarta hinges on transforming formal mandates into operational platforms that connect university laboratories, business needs, and policy priorities in an integrated way (UMS, 2023; Saparita, 2023).

In the long run, this integrated model can enhance regional competitiveness and resilience in the Subosukowonosraten corridor, with Surakarta as an emerging innovation hub.

Educational institutions in Surakarta, notably Universitas Sebelas Maret (UNS) and Universitas Muhammadiyah Surakarta (UMS), play a central role as producers of knowledge, skilled human capital, and early-stage innovations (UMS, 2023).

Through research centers, vocational programs, and science-and-technology transfer units, universities can align curricula and research agendas with the needs of local industries, from creative economy to digital services and

manufacturing. UMS has explicitly positioned itself to drive research downstreaming via collaboration with Solo Technopark, seeking to move academic outputs closer to commercialization and community application (UMS, 2023).

This orientation mirrors broader national efforts, such as Kedaireka-style matching schemes, to strengthen university–industry R&D collaboration and raise Indonesia's innovation performance (PPI Belanda, 2025; Khoirunisa, 2023). For Surakarta, embedding such initiatives requires consolidating internal governance within campuses, including intellectual property management, incubation services, and structured internship pipelines with local firms.

Universities must also cultivate an entrepreneurial culture among students and lecturers, supported by mentoring, seed funding, and partnerships with investors and banks, as seen in recent programs linking campuses, industry, and financiers. When these instruments are synchronized with city-level innovation agendas, universities can act as anchor institutions that localize global knowledge and adapt it to Surakarta's socio-economic context (Demartoto, 2022; Susantono et al., 2023).

Thus, higher education institutions are not only knowledge suppliers but also institutional brokers that connect government priorities with market opportunities in the regional innovation ecosystem.

Industries in and around Surakarta contribute critical resources to the innovation ecosystem by articulating market needs, providing real-world testbeds, and absorbing new technologies into production processes. Local manufacturing, creative industries, and MSMEs require continuous upgrading in productivity, product differentiation, and digital capabilities to remain competitive in regional and national markets.

Collaboration with universities and technoparks enables firms to access applied research, prototyping facilities, and tailored training programs that would be difficult to develop independently (UMS, 2023; PPI Belanda, 2025).

The experience of technoparks in several Indonesian regions shows that co-location and structured support—such as business incubation, IP assistance, and MSME mentoring—can significantly strengthen collaborative knowledge creation between academia and industry (Saparita, 2023).

In Surakarta, Solo Technopark and local business incubators have been studied as vehicles to enhance MSME development and connect firms with the research community through a triple helix model (UMS, 2023; Susantono et al., 2023). To deepen their role, local industries need incentives and risk-sharing mechanisms, including tax breaks, public procurement opportunities, and matching grants that encourage them to co-invest in innovation projects with universities (PPI Belanda, 2025).

Over time, the growing density of firm–university–government interactions can generate spillovers that foster clusters of innovative enterprises in Surakarta's urban economy (Susantono et al., 2023).

Local government in Surakarta holds a pivotal coordinating role by setting regulatory frameworks, providing infrastructure, and orchestrating multi-stakeholder platforms that sustain innovation (Demartoto, 2022; Susantono et al., 2023).

Research on Central Java's public innovation capacity highlights how Surakarta City Government has built internal mechanisms involving research and development units, organizational departments, and labor agencies to stimulate innovation in public services (Susantono et al., 2023).

The establishment of a dedicated regional regulation on innovation in 2024 signals an effort to institutionalize innovation processes that connect government institutions, local governments, research bodies, and communities in a single system (Surakarta City Government, 2024).

In practice, Surakarta has experimented with digital innovations, such as the e-Tanov platform for managing innovation data and initiatives across agencies, indicating a move toward more systematic innovation governance (Susantono et al., 2023). During the Covid-19 pandemic, Surakarta's Government also collaborated with a cellular operator to deploy 5G-supported digital public services and mobile vaccination units, demonstrating the potential of public–private innovation in crisis response (Demartoto, 2022).

These experiences show that local government can act as both regulator and innovator, using pilot projects to demonstrate new solutions and then scaling them through city-wide policies and platforms (Susantono et al., 2023).

Strengthening this role requires enhancing policy capacity, inter-agency coordination, and data-driven decision-making so that innovation initiatives align with broader development strategies (Susantono et al., 2023; Khoirunisa, 2023). Ultimately, local government must ensure that innovation governance in Surakarta remains inclusive, transparent, and oriented toward public value creation rather than narrow technological showcase.

In Surakarta, the integration of universities, local government innovation platforms like e-Tanov, and business incubators can operationalize the triple helix by providing structured channels for idea generation, experimentation, and scaling (Susantono et al., 2023).

These channels may include joint research schemes, co-funded innovation vouchers, thematic innovation challenges, and public labs that involve communities in co-creation processes. Concrete mechanisms for cooperation among educational institutions, industries, and local government in Surakarta can be built through technoparks, incubators, and targeted innovation programs (UMS, 2023; Saparita, 2023).

The collaboration between UMS and Solo Technopark exemplifies how universities can drive research downstreaming by co-developing incubation programs, entrepreneurship training, and industry-oriented applied research projects (UMS, 2023).

Local government can support these initiatives by aligning them with city innovation regulations, providing land or facilities, and integrating successful prototypes into public procurement and service delivery (Surakarta City Government, 2024; Susantono et al., 2023). At the same time, firm participation can be encouraged through access to shared laboratories, pilot project opportunities in public services, and visibility within regional promotion strategies.

National and regional policy instruments create enabling conditions that can be leveraged by Surakarta's innovation actors to

deepen cooperation (PPI Belanda, 2025; Susantono et al., 2023). Programs such as Kedaireka have proven effective in temporarily boosting university–industry collaboration metrics by providing matching funds and a digital platform that connects researchers with firms (PPI Belanda, 2025).

Central Java's regulations on creative economy and innovation also define strategic sectors and coordination mechanisms that can guide Surakarta in aligning city-level innovation with provincial priorities (Susantono et al., 2023). By embedding triple helix collaboration into medium-term development plans and sectoral strategies, local government can ensure resources for innovation are not treated as ad-hoc projects but as part of core development policy (Demartoto, 2022; Susantono et al., 2023).

Universities and industries, in turn, can respond to these policy signals by designing research and investment portfolios that target identified priority areas and leverage available public support schemes.

Cross-border learning with other regions, such as West Java's innovation ecosystem and UGM's partnership with MIT for entrepreneurship ecosystems, can offer practical lessons on governance and program design (Khoirunisa, 2023; UGM, 2024). Harnessing these policy instruments and learning opportunities can help Surakarta accelerate the maturation of its innovation ecosystem through more coherent and mutually reinforcing collaborations.

Constructing Digital and Physical Infrastructure

Surakarta, a city in Central Java, Indonesia, is transitioning towards a knowledge-based economy (KBE) by focusing on constructing digital and physical infrastructure that facilitates the exchange and collaboration of knowledge.

This transformation recognizes that knowledge-sharing between educational institutions, industries, and the local government can catalyze innovation and economic growth. Surakarta's approach aims to enhance connectivity among these sectors, thereby fostering an environment conducive to knowledge transfer and collaboration.

For instance, the city's initiative to distribute 3,000 free gadgets to students, including laptops and tablets, illustrates a strategic commitment to improving educational resources and accessibility to technology (Wardani 2022).

In recent years, the establishment of digital infrastructure in Surakarta has been prioritized to support the local economy. Local government initiatives have focused on expanding internet connectivity, which is vital for accessing digital resources and platforms. Projects like community Wi-Fi hotspots aim to ensure that even the less privileged populations can access online information and educational materials.

This digital infrastructure is complemented by investments in physical spaces such as innovation hubs and co-working spaces, where entrepreneurs and students can collaborate on projects and share ideas (Demartoto, 2022).

The development of these resources can be traced back to governmental policies aimed at bolstering the innovation ecosystem in Surakarta, which emphasize public-private partnerships and community involvement (Harjono et al., 2024).

Digital landscape in Surakarta has been further enriched by educational institutions collaborating with local industries to create more effective learning environments and training programs. Universities in the region are increasingly incorporating technology into their curricula, equipping students with essential skills for the modern workforce. Programs that bridge theoretical knowledge and practical skills are being implemented to enhance employability in the growing digital economy.

This collaboration not only empowers students but also enriches the local job market with a skilled talent pool capable of contributing to the knowledge-based economy (Sutianingsih, 2021). Educational institutions have thus become pivotal in fostering an ecosystem that encourages lifelong learning and innovation among various stakeholders (Ayu et al., 2023). Surakarta's focus on innovation extends to fostering an entrepreneurial culture through digital platforms that enable networking and collaboration among local startups and entrepreneurs. Initiatives promoting entrepreneurial orientation within small and medium enterprises (SMEs) are critical as these businesses form the backbone of the city's economy (Harjono et al., 2024).

Networking events, workshops, and competitions facilitated digitally encourage collaboration between novice entrepreneurs and seasoned businesspeople, enhancing knowledge exchange (Suprapto et al., 2024). The structured approach to networking within Surakarta exemplifies how diverse insights can lead to innovation (Špička, 2022).

Physical infrastructure, such as transport and logistics hubs, plays a significant role in enabling knowledge exchange in Surakarta. Efficient transport systems are vital for facilitating the movement of goods and ideas, thereby contributing to the broader goal of economic integration and collaboration among regions.

The city's investment in upgrading roads and public transport systems improves access to educational institutions, industries, and innovation centers, which is instrumental in nurturing a conducive environment for a knowledge-based economy (Arif & Purnomo, 2017).

Improved logistics capabilities also enhance the capacity of local businesses to engage with national and international markets, thereby expanding their reach and impact. The role of local governance in regulating and monitoring the implementation of such digital infrastructure cannot be underestimated.

The Surakarta government has enacted numerous policies focused on digital transformation, exemplified by the adoption of regulatory frameworks that encourage transparency, innovation, and cooperation among varying sectors (Zunariyah & Ramdhon, 2020).

Programs aimed at collecting and analyzing data on urban management and service delivery further enhance the city's governance, allowing for evidence-based decision-making that aligns with the principles of a knowledge economy. These policies lay critical groundwork for fostering an ecosystem that supports sustainable development through collaborative efforts.

While Surakarta has laid the foundation for a thriving knowledge-based economy through digital and physical infrastructure, continuous evaluation and enhancement of these

systems are necessary to maintain progress. Implementing feedback mechanisms to assess the effectiveness of infrastructure investments and collaboration initiatives is essential.

Engaging with community members, educators, and business stakeholders ensures that the systems in place remain relevant and responsive to the evolving needs of the population. By establishing a culture of adaptive governance and proactive engagement, Surakarta can ensure that its innovation ecosystem thrives and continues to contribute towards its characteristic as a knowledge-based city.

Encouraging Entrepreneurship and Social Inclusivity

The city's transformation into a knowledge economy is grounded in the understanding that economic growth cannot solely rely on traditional industries; instead, it must leverage knowledge and innovation.

Local government policies have been paramount in encouraging knowledge-based entrepreneurship, which includes providing support structures for start-ups and small enterprises that drive economic growth.

This encompasses financial assistance, access to information, and educational programs that equip the workforce with necessary skills Silva et al. (2024). A pivotal aspect of Surakarta's KBE strategy is enforcing policies that actively support entrepreneurship among marginalized and disadvantaged groups.

For instance, specific programs have been introduced that target women and youth, allowing them to access training and resources necessary to start and sustain businesses (Pathak & Muralidharan, 2020). Given that entrepreneurship serves as a vital source of job creation and economic dynamism, these policies are essential for unlocking untapped potential within the community. By involving social enterprises, the government aims for an inclusive economic model that benefits all segments of society and addresses disparities often prevalent in traditional business sectors (Cheraghi et al., 2018).

The role of technology in facilitating inclusive entrepreneurship in Surakarta cannot be overstated. Local government has promoted digital literacy through workshops and training programs focused on equipping potential entrepreneurs with the skills needed to navigate the increasingly digital business landscape (Sule et al., 2022). By providing access to technologies such as smartphones and internet connectivity, the city enhances the capability of individuals from various backgrounds to engage in entrepreneurial opportunities, thus promoting equitable growth. This technological emphasis ensures not just the participation but also the integration of diverse perspectives that enrich the entrepreneurial ecosystem.

Implementation of supportive public policies is also essential to cultivate a proactive business environment in Surakarta. These policies aim to reduce bureaucratic hurdles that often impede the establishment of new businesses.

For example, streamlining the business registration process encourages aspiring entrepreneurs to formalize their operations, thereby fostering a culture of legal compliance and social responsibility (Edoun et al., 2020). Moreover, fiscal incentives such as tax breaks or microfinance initiatives support fledgling

businesses, allowing them to thrive in a competitive market without the stranglehold of initial financial strain. These policies directly impact community engagement by demonstrating governmental commitment to championing local entrepreneurial ventures.

The competitive landscape of Surakarta's economy is further enhanced through innovative business incubation programs supported by the local government. These incubation programs aim to provide start-ups with tailored mentorship, networking opportunities, and essential resources while nurturing an inclusive environment where diverse entrepreneurial ideas can flourish (Singh, 2022). Initiatives highlighting the importance of creating networks among entrepreneurs enable collaboration and knowledge sharing, which are key driving factors for the success of new ventures.

This underlines the significance of integrating community resources with governmental support to ensure that entrepreneurship becomes a viable option for all demographics. Regular assessments of governmental programs and their social impacts will be instrumental in ensuring their effectiveness in fostering entrepreneurship within marginalized communities (Urban & Gaffurini, 2018).

Engaging stakeholders from various sectors in these evaluations enables the local government to adapt policies to the evolving needs of the population while addressing potential gaps in implementation.

Strategic Implementation Pathways for Surakarta's Knowledge-Based Transformation

To realize a sustainable and inclusive knowledge-based economy (KBE), Surakarta has initiated a series of concrete, multi-dimensional steps that bridge technological advancement with its distinctive cultural identity.

The foundational phase of this transition involves the systematic modernization of digital and physical infrastructure to facilitate seamless knowledge exchange. This is operationalized through the expansion of internet connectivity via community Wi-Fi hotspots and the strategic distribution of hardware, such as the provision of 3,000 gadgets to students to ensure equitable access to digital resources.

Parallel to these digital efforts, the city is establishing physical innovation hubs and co-working spaces where entrepreneurs, students, and researchers can collaborate on knowledge-intensive projects. These efforts are further reinforced by the modernization of transportation and logistics networks, which improves physical access to innovation centers and connects local industries to broader national and international markets.

A secondary crucial step focuses on cultivating a high-synergy innovation ecosystem through the "Triple Helix" collaboration between academia, industry, and government. Higher education institutions, exemplified by Sebelas Maret University, are increasingly aligning their curricula with modern industrial demands to bridge the gap between theoretical research and practical workforce skills.

This ecosystem is supported by digital networking platforms and business incubation programs that provide local startups with tailored mentorship and competitive networking opportunities. By

fostering an entrepreneurial culture that integrates diverse community insights, the city catalyzes innovation while maintaining a culture of lifelong learning.

The final and most critical step in Surakarta's model is the implementation of proactive governance and social inclusivity policies. The local government is actively streamlining bureaucratic hurdles, such as simplifying business registration processes, to encourage formal entrepreneurship.

Furthermore, the city provides fiscal incentives, including tax breaks and microfinance initiatives, to alleviate the financial strain on fledgling knowledge-based enterprises. To ensure that this economic shift does not marginalize vulnerable populations, Surakarta has launched targeted digital literacy and training programs for women, youth, and other disadvantaged groups.

Through these integrated measures, Surakarta seeks to transform its cultural capital into a competitive advantage, proving that medium-sized cities can successfully balance economic modernization with the preservation of local heritage.

CONCLUSION

Surakarta's efforts are particularly noteworthy in their focus on inclusivity and human development alongside economic growth. The city has implemented targeted programs to enhance digital literacy and creative skills among local communities, addressing the crucial relationship between human capital development and KBE advancement.

This model offers valuable insights for other medium-sized cities in emerging economies facing similar development challenges. Its strategic approach demonstrates that cities need not choose between preserving cultural heritage and pursuing economic modernization; rather, these objectives can be mutually reinforcing within a KBE framework.

As global economic patterns continue to evolve, the experiences of cities like Surakarta provide empirical evidence that medium-sized urban centers in developing regions can successfully transition toward knowledge-based economies while maintaining their distinctive cultural identities.

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