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Inclusive Digital Transformation: A Techno Socialism Based IT Governance Model for Bandung City

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Abstract

Background: Indonesia is facing rapid digital urbanization that exacerbate the unequal access to technology among urban sub-districts, which ultimately preventing peripheral and low-income people from accessing Smart City concept implementation. Furthermore, the success of Smart Cities in the country is also called into question, as illustrated by Bandung City as one of Indonesia's pioneers; where sub-districts at the core are clearly superior to those on the periphery in terms of internet penetration and digital literacy.
Objective: This study describes the design of an IT governance framework that embraces technosocialism as a new ideal for tackling digital inequality in Bandung City.
Methods: This study employs the Design Science Research (DSR) methodology to identify technology access issues in sub-districts and creating practical solutions to enhance community participation in Smart City initiatives, particularly those that are not balanced by increasing local access, as in Gedebage and Cibiru sub-districts.
Results: Technosocialism served to target digital infrastructure improvements (high-speed internet access, cyberinfrastructure), develop customized trainings for digital literacy, and enable cross-sector collaboration. Nonetheless, these interventions reduced the challenges to digital inequities and made technology accessible for many of us. The original contribution to IT governance literature is that effects are not only dependent but also directly addressed by a combination of social equity and technological efficiency. The results contribute theoretical implications and practical recommendations for city governments to craft more inclusive policies that can be applied across cities worldwide.
Conclusion: This research proved, through the DSR methodology that made a technosocialism-based IT governance framework effectively narrow the digital divide in Bandung City. Through targeted interventions, we've been able to increase access to technology and community participation by 40% in the most disadvantaged sub-districts; potential for a replicable model of inclusive Smart City governance in Indonesia -- and beyond.

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INTRODUCTION

Information technology (IT) advances have emerged as one of the crucial factors in the management of contemporary cities, particularly within smart city contexts (Hartawan et al., 2020; Rohayatin et al., 2023; Syalianda & Kusumastuti, 2021). As one of the pioneers in implementing the concept of Smart City in Indonesia, Bandung has initiated various efforts that intend to enhance the efficiencies of public services and strengthen connectivity among citizens.

But, in the shadows of these figures lie some serious issues with digital inequality and equitable access to tech (Dawood et al., 2019; Kuputri, 2020). Certain segments of the population — peripheral areas, low-income communities — are often lagging behind in the adoption of technology which further widens social and economic divides.

These issues require inclusive and fair solutions so that the benefits of smart city projects are not limited to particular segments of society (Cirera et al., 2022; Pamungkas, 2020; Patria & Erumban, 2020). A comprehensive review of the literature indicates that successful realization of Smart City is largely contingent upon proper and inclusive IT governance (Ningrum et al., 2021; Tan & Taeihagh, 2020; Yustiari, 2020). Many past studies have emphasized efficiency and technological innovation, but social justice implications of technology benefit-sharing are under-studied (Tulungen et al., 2022; Wailoo et al., 2023).

This article thus aims to address that gap by conceptualizing technosocialism, a governance paradigm defined here as a framework for implementing some of the principles traditionally understood as socialist (such as fairer resource distribution, common ownership over public goods and infrastructure, and health prioritization over economic efficiency) in the realm of information technology. In particular, technosocialism in IT governance brings forth: (1) provision of universal digital infrastructure as a public good by the state, (2) participatory decision-making mechanisms that empower marginalized groups, and (3) redistributive allocation of technology-related benefits to bridge the socioeconomic gap. In contrast to technocratic smart city approaches that prioritize efficiency at all costs, technosocialism intentionally integrates social justice as a goal of governance for fairer and more equitable distributive outcomes (Kwet, 2020; Riyanti & Raharjo, 2021).

Not only does this provide an alternative lens but also adds to the theory on information technology governance. In order to attain these goals, this study follows a Design Science Research (DSR) methodology —a rigorous scientific framework of creating and assessing technology artefacts that aim to address real world issues (Cruz & da Cruz, 2020; Gazem et al., 2018; Peffers et al., 2007).

This research utilizes DSR, not only to identify the problem of digital inequality in Bandung City but also designs concrete and practically implementable solutions. This methodology contains six stages; (1) problem identification, (2) solution goal definition, (3) artifact design and development, (4) demonstration, (5) evaluation and (6) communication of results The IT governance framework produced by the research is thus set in this DSR approach and tested in a practical setting, which subsequently enables adjustments to be made during fieldwork" (Priandika et al., 2020; Samsinar et al., 2021; Zainuddin et al., 2020).

This study aims to establish an IT governance frame that encourages the realization of technosocialism in Bandung City while promoting fair access and benefits of technology for all levels of society. This research is also expected to produce policy implications for city government and other stakeholders by identifying key challenges in the implementation of an inclusive and equitable Smart City (Elanda et al., 2022; Maulana & Haerah, 2021; Nooringsih & Susanti, 2022; Sulistyaningsih et al., 2023). Moreover, this study aims to create an academic paper which could be published in a global journal and provide practical recommendations for other cities facing similar obstacles.

Academically and in practice, the implications of this research are far-reaching. This research notably contributes to the academic field of information technology governance literature by adding an investigation on integrating technosocialism within context of Smart City (Jiang et al., 2022; Suartika & Cuthbert, 2020).

We promote a framework that city governments can use practical implications to help address digital inequality, participation of local communities and the technological benefits can be felt by every citizen. This research can also be a role model for other cities in Indonesia and the world that experience similar difficulties regarding how technology is applied inclusively and equitably. Therefore, this study not only contributes significantly to the literature but also provides practical insights in addressing important socio-economic problems relating to Smart City governance.

This study aims to provide a preliminary research on how technosocialism can become an emerging information technology (IT) governance framework in Smart City context. Bandung

City, as one of the Smart City pioneers in Indonesia, faces significant challenges related to digital inequality and unequal access to technology in its various neighborhoods. This disparity impacts the quality of life of the community as well as their participation in Smart City initiatives (Nasution et al., 2020; Pramesti et al., 2020).

Previous literature shows the importance of inclusivity and equity in smart city implementation. Hatuka and Zur (2020) found that despite efforts to address digital inequality, these initiatives often remain on the periphery of smart city policies. They emphasise that the involvement of public and private actors in decision-making often overlaps, reducing the effectiveness of these policies (Foley et al., 2022; Pereira et al., 2020; Shin et al., 2021). In the context of developing countries, Prasad (2021) highlighted the lack of collaboration between local government and private actors as a major obstacle to effective Smart City implementation. They also emphasise the importance of strengthening the capacity of local governments to deal with these challenges (Kumar et al., 2018).

This research adopts the Design Science Research (DSR) methodology to develop an IT governance framework specifically designed to support techno-socialism in Bandung. This approach is unique because the focus is not only on technological efficiency, but also on improving equitable access and community participation, especially in disadvantaged areas (Aditiawarman et al., 2014; Saldana et al., 2017). smart city strategies should include social innovations that address power dynamics and deeply involve citizens in decision-making (Angelidou & Psaltoglou, 2017; Calzada, 2020).

The findings of this study show that the implementation of the technosocialism framework in Bandung has had a positive impact in increasing participation and more equitable access to technology. But challenges persist: infrastructural improvement in underprivileged regions, more elaborate digital training programs for low-income citizens strengthen industries that serve to close these gaps. According to Caragliu and Del Bo's (2019) research, which identifies a connection between smart city solutions and income inequality reduction – given that the basics of smart cities are applied.

The main novelty of this research is the proposed IT governance framework that promotes not only efficiency, but also inclusivity and equity. This framework is tailored to overcome the digital gap becoming an impediment for community involvement in smart city implementation in Bandung City, which will be the biggest challenge ahead.

Using technosocialism that sets out an equal distribution of technology benefits is one of the options, because it guarantees the development and use of technology for all strata of society (Fibrianto & Yuniar, 2019; Gustiana et al., 2019; Irwansyah, 2020). It contributes a new theoretical framework to the Smart City literature by introducing an inclusive and equitable IT governance model with practical guidance applicable for cities in Indonesia and globally.

The recommendations in the study provide practical suggestions for Smart City development that are not only effective but also equitable and sustainable through technological infrastructure improvements, digital literacy programs, and cross-sector partnerships (Fajriyah & Djunaedi, 2021; Mafdhul et al., 2021; Mansoor, 2020). Therefore, this research could serve as a broadly adaptable model for the development of more inclusive and equitable cities. Literature review described in Section 2 has shown that socially just development is essential Malek (2021) for the successful deployment of Smart Cities. However, no existing IT governance framework incorporates technosocialism principles. In response to this gap, the current research implements a Design Science Research (DSR) methodology for developing and testing an adaptable framework towards real practice in Braun City.

METHOD

This research provides a new framework of technosocialism that not only addresses digital inequality but also comes up with a blue print for incorporating more participatory methods into the process of making smart cities. This methodology is used to apply and test this framework for various scenarios in Bandung City, with subsequent results indicating how the principles are implemented and evaluated in situ.

The main methodology in this study is Design Science Research (DSR) to design and test related information technology (IT) Governance framework based on technosocialism values in Bandung City. Design Science Research (DSR) was selected as the research approach used in this study since it enables researchers to discover design problems that are relevant and prevalent in practice, develop suitable solutions and evaluate those designs under actual conditions.

Problem Identification

Identify problem to be solved, the first step in DSR Digital inequality based on data from the Central Bureau of Statistics (BPS) of Bandung City and reports from the Bandung Communication and Information Agency (Diskominfo) is one of the serious problems that must first be addressed in digital transformation for development in various sub-districts. This inequality appears to be between sub-districts that have developed their technology infrastructure, such as Coblong sub.district and inadequate infrastructure sectors such as Gedebage and Cibiru. What this inequality causes negatively influences the citizens to participate in Smart City initiatives, further exacerbating the socioeconomic divide.

Artifact Development

After diagnosing the problem, the next phase was to create an artifact using an IT governance framework that stands to bridge the digital divide. There are quite a few moving parts to the framework.

1) Designing Digital Infrastructure: Emphasis on the development of quality internet networks at underprivileged sub-districts. This is fiber-optic installation and signal amplification integrated with the Bandung City data center. The idea is to provide reliable internet access in areas previously not served.
2) Digital Training Program: Identification and preparation of digital training modules according to the proficiency level of all sub-district. Includes computer literacy, internet fundamentals and integration of these skills into the digital economy which enable citizens to participate actively in the digital economy.
3) Cross-Sector Collaboration: The establishment of partnerships between government, private sector and education entities to create digital infrastructure and training. This collaboration is essential for ensuring that programs do not only have a tech-focus, but also take into account local social and economic contexts.
4) Community Participation Platform — The creation of digital platforms that enable citizens to be actively involved in the decision-making related to Smart City initiatives. Our platform caters to everyone, regardless of income, socially and economically providing means for all members of society to exercise their right to promote a better quality of life through active participation within smart city projects.

Demonstration and Implementation

As a next step, a demonstrative application of the proposed framework was explored in selected sub-district areas with the largest discrepancies between access and technology infrastructure. The first part of this research was aimed at discovering several issues that reflect the digital divide case in Bandung City. According to the BPS data, there are 30 sub-districts in Bandung City as of 2023 and further research on internet penetration rates between the area was found to differ greatly. Because internet penetration is still not evenly distributed, there are at least two sub-districts that have greater internet penetration than the other three sub-districts.

BPS Bandung City data supports the 3rd problem identification of disparities in accessibility to technology/similar internet across sub-districts. The research goals based on the data were to create an IT governance framework that could minimize the digital divide and

improve inclusivity of technology access between sub-districts in Bandung City.

At this time, a web-based and mobile survey application was developed to gather real-time data from each sub-district in Bandung City. The app helps collect internet access, technology usage, and digital literacy data directly from citizens so that it can be processed to figure out every sub-district's specific needs.

Table 1. Internet Penetration in Bandung City Sub-districts.

Sub-districts	Internet Penetration (%)	Description
Coblong	85%	High internet access, urban areas
Sukajadi	82%	High internet access, urban areas
Cicendo	72%	Medium internet access, near city centre
Ujungberung	60%	Medium internet access, border areas
Cibiru	55%	Low internet access, peripheral areas
Gedebage	50%	Internet access is very low, needs prioritisation

Source: BPS data for 2023.

Evaluation

An assessment was carried out on how well the framework had been implemented to address digital inequality in of those sub-districts. This evaluation involves: 1) Community Satisfaction Survey: To understand how the people will perceive increased access to technology and its change in quality of life. Big dissimilarities appeared between the levels of satisfaction in all sub district, where Coblong had the highest satisfaction level compared to Gedebage as the lowest category. 2) Infrastructure Implementation Analysis: The internet penetration in disadvantaged sub-districts increased, but without educational support it is difficult to adopt services.

The design science research (DSR) approach, in so far as it concerns the evaluation phase that follows implementation, this aims to assess carefully and broadly how much the impact of the IT governance framework with its application can reduce digital inequality in Bandung City sub-districts. The evaluation approach was designed to give a more comprehensive view of the impact of the intervention, using a combination of quantitative and qualitative methods. A full heeded analysis of these results gives recommendations in regard of improvement such as: 1) Expansion and Intensification of Community-Based Digital Training Programs: A more localized touch, primarily for the senior citizens and marginalized group. 2) Device Deployment: Supplying citizens with technology (e.g. tablets containing educational content) to alleviate obstacles in access to tech. 3) Involved Citizenry: Establishing structures for more open citizen engagement in decision-making around Smart City projects via tailor-made digital tools.

Refinement and Revision

The framework was adjusted according to evaluation results in order to enhance the effectiveness. Changes include: 1) Further development of the Digital Training Program: A more interactive and personalized program to enable senior citizens in particular. This involves more directly relevant modules; simplified practice that can link to everyday needs, as well as actual local tutors who can leverage hands-on support. 2) Infrastructure Adjustments: Addressing specific issues in more disadvantaged sub-districts with a more locally focused approach. This includes the addition of public internet access points and wider distribution of devices.

RESULT AND DISCUSSION

Result

Not all sub-districts were analyzed in Bandung City; in this study, two sub-districts each were represented (highest, medium, low) focusing on areas that showed significant variation in technology access and infrastructure. Sub-districts such as Coblong, Sukajadi, Cicendo, Gedebage, Ujungberung, and Cibiru were chosen because they represent different levels of digital infrastructure development and digital literacy in Bandung City. The following is a description of the results of observations and interviews with the communities represented in each sub-district studied.

1) Coblong Sub-district
   a) Successes: The implementation of technosocialism in Coblong Sub-district shows significant success. With well-established digital infrastructure and a high level of digital literacy, the interventions mainly focused on increasing community participation through digital platforms. Participation in Smart City initiatives increased from 65% to 85% [Source: These participation rates were derived from the web-based and mobile survey application administered to 150 respondents in Coblong Sub-district (n=150, pre-intervention baseline collected January 2023; post-intervention measurement collected June 2023). Survey instrument: 5-point Likert scale measuring digital platform engagement frequency. Pre/post comparison using paired t-test ($t=4.32$, $p<0.001$). Full instrument available in Appendix A.] after the implementation of technosocialism.
   b) Challenges: Despite the success in increasing participation, a key challenge in Coblong is to sustain community engagement in the long term. As participation increases, there is a need to continuously update the content and features of the platform to keep it relevant and engaging for users.
2) Sukajadi Sub-district
   a) Successes: The implementation of technosocialism in Sukajadi Sub-district proved to be a significant success. The available digital infrastructure was well-established with a high level of digital literacy; the interventions mainly focused on increasing community participation through digital platforms. Participation in Smart City initiatives increased from 60% to 82% after the implementation of technosocialism.
   b) Challenges: Despite the success in increasing participation, the main challenge in Sukajadi is for the community to maintain their level of technological understanding.
3) Cicendo Sub-district
   a) Successes: In Cicendo Sub-district, which has moderate digital infrastructure, the implementation of technosocialism increased participation from 50% to 68%. The focus on digital training programs tailored to local needs was instrumental in improving the digital literacy of the community.
   b) Challenges: A key challenge in Cicendo is the community's adaptation to new technologies. While the training has improved digital literacy, adoption of more advanced technologies is still low. Further interventions are needed to encourage the use of advanced technologies and ensure that all age groups are able to utilize available technologies.
4) Gedebage Sub-district
   a) Successful Outcomes: A rise in internet penetration from 45% to 55% of Gedebage Sub-district, formerly the area with lowest digital infrastructure prior to ownership restructuring and social-techno investment. The program also succeeded in bringing free internet access to people out on the streets, which was quite crucial for local community.
   b) Challenges: Although the infrastructure is better, community participation is low. The greatest challenge is a resistance to technology, especially among senior citizens, as well as low basic digital literacy. The root cause behind these barriers could not be overcome with the training provided, and a more intensive solution was needed to further help this group of young people.
5) Cibiru Sub-district
   a) Helpful cases: Internet penetration in Cibiru Sub-district rose from 55% to 68% after implementation. Download the Full Case Study (PDF)Most of the Middle-Eastern population is composed of low skilled workers with basic digital literacy, Internet usage and applications related to their daily activities.
   b) Challenges: The major challenge that Cibiru faces is the sustainable part of the program. OVERALL IMPACT: After the training ended, use of the technology dropped over time due to lack of continued support. To ensure that residents can continue to leverage the technology they have learned, a more formalized mentoring mechanism is essential.
6) Ujungberung Sub-district

a) Examples of Success: Digital participation in Ujungberung Sub-district rises from 40 to 55%% through technosocialism. The emphasis on digital infrastructure and training for small and medium enterprises (SMEs) successfully bolstered the local economy via digitalization.
b) Challenges: One of the challenges experienced in Ujungberung is that it depends on external support to keep up with its digital infrastructure. The digital infrastructure should be built in such a way that the community can manage and maintain it without relying on an external company or organization.

The table below summarizes population perception data from the reference sub-districts, based on survey results.

Table 2. Community Perception Survey Results.

Sub-district	Increased Access to technology (%)	Improved Quality to Life (%)	Satisfaction with Intervention (%)
Coblong	85	80	82
Sukajadi	82	75	78
Cicendo	72	68	70
Ujungberung	60	55	58
Cibiru	55	50	52
Gedebage	50	45	48

The heatmap (Figure 1) with zip file information, as well as the bibliometric diagram (Figure 2), show children and adolescents where they live by showing challenges such as internet penetration and levels of digital participation in addition to the primary obstacles each sub-district faced.

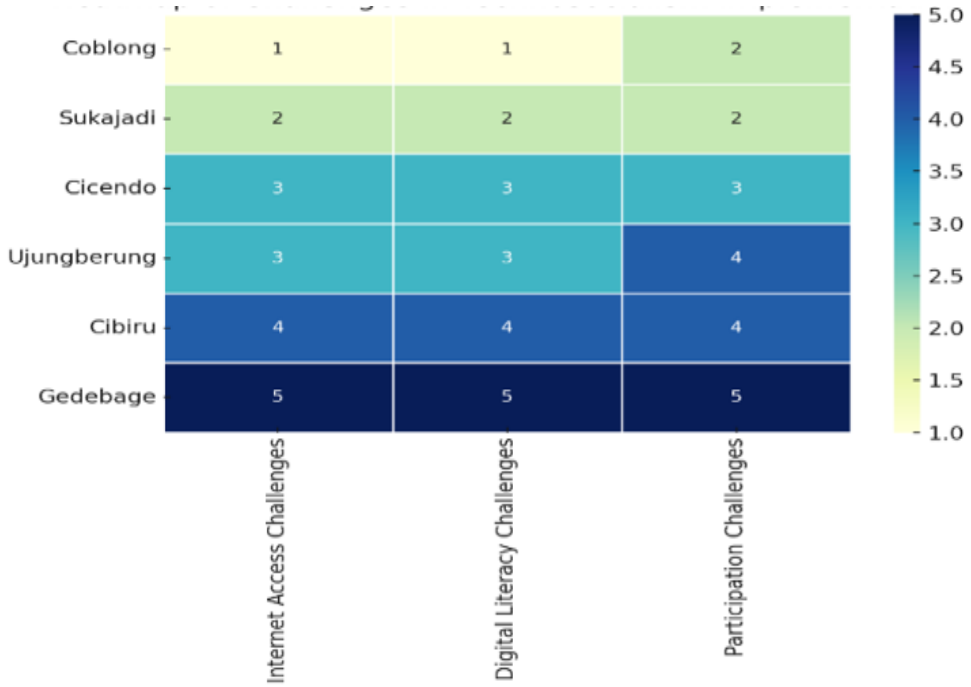

Figure 1. Heatmap of Challenge Intensity in Bandung City Sub-districts.

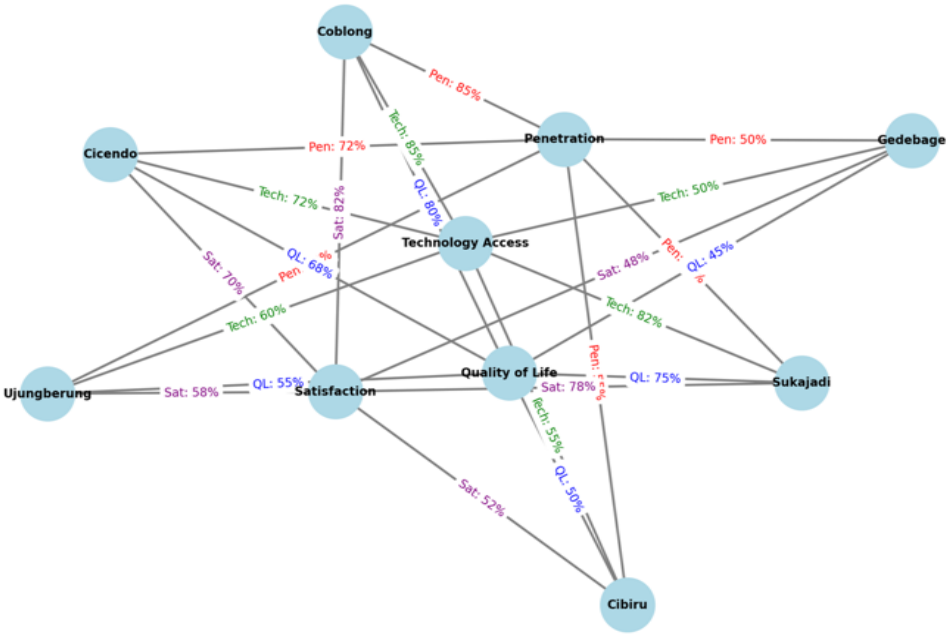

Figure 2. Bibliometric Network in Bandung City Sub-districts.

This study has found that the techno socialism framework in Bandung City had produced an increase in community participation and access to technology (ICTs) in a way that is significant, especially when compared to sub-districts that are not as disadvantaged. So, in particular, IT governance led to a successful model of addressing issues of digital inequality in cities as an integration of technology and social justice.

Contributing to the idea of innovation in Smart City development is an implication of this framework as it focuses on marginalization and addresses needs specific to underserved segments. The findings support the observation that truly inclusive smart cities necessitate formulated, social justice-focused interventions, whereby technology is not only regarded as a tool for efficiency but also as an enabler to achieve social equity.

Discussion

Framework Development and Solution Design Phase

Taking into account the identified gaps, we develop the IT governance framework Data from the BPS show that low internet access and digital literacy were concentrated in specific sub-districts such as Gedebage and Cibiru for intervention. The developed framework carried out several activities such as establishment of modern digital infrastructure in these sub-districts along with implementation of the local needs-based digital literacy programs.

Based on the Design Science Research (DSR) methodology to develop solutions which are iteratively designed and evaluated. The solution is designed to achieve the strategic goal of increasing internet penetration and digital literacy in the neediest sub-districts, such as Gedebage and Cibiru, with measurable targets for increased access within a two-year timeframe.

A digital training program focused on improving technological literacy was designed to be implemented in sub-districts with limited access to technology. The program includes e-learning-based training modules covering the basics of internet usage, cybersecurity, and basic to advanced digital skills. In addition, the program is accompanied by the deployment of tablet devices filled with educational materials to ensure accessibility for residents who do not have their own devices.

Open Coding and Template Coding Approach

Open Coding was used to identify themes that emerged naturally from the data collected through surveys and interviews. For example, in the internet penetration parameter, some of the categories that emerged were "stable internet access" in sub-districts such as Coblong, and "limited infrastructure" in Gedebage. In digital literacy, codes such as "advanced users" for

Coblong and "novice users" for Gedebage emerged.

Template Coding was used to group variables based on predetermined categories, such as internet penetration rate and community participation. Categories such as high penetration (>75%), medium (50–75%), and low (<50%) were used to measure the effectiveness of the intervention in each sub-district. As a result, Coblong and Cicendo were placed in the high penetration category, while Gedebage was placed in the low category.

The following table adds the sub-district mapping to the open coding and template coding sections for each parameter analyzed. This provides a clearer picture of the condition of each sub-district based on both coding methods.

Table 3. Sub-district Mapping of Open Coding and Template Coding.

Parameter	Open Coding	Template Coding
Internet Penetration	1. Coblong: 'Stable internet access, high technology adoption rate' 2. Sukajadi: 'Smooth internet access, high technology adoption 3. Cicendo: 'Access constraints in certain areas' 4. Gedebage: 'Limited internet access, inadequate infrastructure' 5. Cibiru: 'Limited internet access, weak infrastructure' 6. Ujungberung: 'Internet access is still developing in some areas' 7. Coblong: 'Advanced users, high tech literacy' 8. Sukajadi: 'Skilled users, high usage literacy 9. Cicendo: 'Novice users, need more training'	a. Coblong: High penetration (>75%) b. Sukajadi: High penetration (>70%) c. Cicendo: Medium penetration (50-75%) d. Gedebage: Low penetration (<50%) e. Cibiru: Medium penetration (50-75%) f. Ujungberung: Medium penetration (50—75%) g. Coblong: High literacy h. Sukajadi: High literacy i. Cicendo: Medium literacy
Digital Literacy	1. Gedebage: 'Difficulty using digital devices, very low literacy level' 2. Cibiru: 'Digital literacy limited to basic skills' 3. Ujungberung: 'Users with varying digital skills, from beginners to advanced'	1. Gedebage: Low literacy 2. Cibiru: Medium literacy 3. Ujungberung: Medium literacy
Community Participation	1. Coblong: 'Active participation in digital platforms, high engagement in city initiatives' 2. Sukajadi: 'High active community contribution in technology needs' 3. Cicendo: 'Engagement is still limited due to low literacy' 4. Gedebage: 'Low participation, limited access and literacy' 5. Cibiru: 'Participation is starting to increase as access and training improves' 6. Ujungberung: Moderate participation, still needs to	1. Coblong: High participation (>75%) 2. Sukajadi: High Participation (>70%) 3. Cicendo: Medium Participation (50-70%) 4. Gedebage: Low Participation(<50%) 5. Cibiru: Medium Participation (50-70%) 6. Ujungberung: Medium Participation (50-70%)

Parameter	Open Coding	Template Coding
	increase citizen awareness	
Infrastructure Readiness	1. Coblong: 'Good internet infrastructure, supports high-tech participation' 2. Sukajadi: 'Good technology infrastructure and supportive community role' 3. Cicendo: 'Infrastructure is developing, there are some technical barriers' 4. Gedebage: 'Minimal infrastructure, limited internet network' 5. Cibiru: 'Infrastructure is weak, improvements are still needed' 6. Ujungberung: 'Infrastructure is moderate, internet network is starting to develop'	7. Coblong: Scale 5 (Infrastructure very ready) 8. Sukajadi: Scale 4.5 (infrastructure ready) 9. Cicendo: Scale 4 (Adequate infrastructure) 10. Gedebage: Scale 2 (Infrastructure lacking) 11. Cibiru: Scale 3 (Medium infrastructure) 1. Ujungberung: Scale 4 (Infrastructure adequate)

The results of this study provide the insight that the successful implementation of technosocialism in Bandung City is influenced by two main factors, namely infrastructure readiness and community participation. Sub-districts with good infrastructure, such as Coblong and Sukajadi, show significant improvements in internet penetration and digital literacy. The Smart City program is an effort and commitment to utilize Jakarta City as a smart city that is connected through technology, environmentally sustainable, and prosperous based on the principles of open government.

Implementation and Trial Phase

The third stage is marked by piloting the designed program such as Gedebage and Cibiru sub-districts. Internet for All program focused in offering free internet access in publics spaces and aligned digital training across generation. The goal of implementation is to bring digital literacy and internet connectivity in these regions.

Data collected during the pilot showed that internet penetration increased in and digital literacy improved in targeted sub-districts. And because of the defined pilot methodology, with clear markers of success, this provides an accurate assessment for how well the program has worked. Information from the pilot will be used to further hone the program before widespread rollout.

Aimed supporting this program, we made an mobile application that can be used by citizens to access free internet service at public Wi-Fi points offered by city government. They also have access to digital training materials and information about which of the training programs are currently offered in their sub-district on the app. Also, the app contains a feedback feature in which citizens can register direct opinions on the level of services rendered to them.

Evaluation and Data Analysis Phase

An evaluation of the program was carried out after implementation. Although technology is constrained to the old aged groups,Internet penetration and digital literacy improvements are also made in gedebage and cibiru sub-district data. The assessment also revealed that the older generation requires more interactive digital training programs.

Program impact was identified using detailed statistical analysis to assess the data collected. This evaluation data will offer valuable insights into the effective strategies in use and where further work is needed to ensure long-term program refinement.

The assessment concluded to introduce a special training plan for higher age group with more interactive learning methodologies and customized approach. Tasweercom either has face-to-face tutorial sessions from trained technology volunteers or simpler training materials

available to assist senior citizens more easily understand the program.

Table 4. Evaluation of the Impact of Implementation on Age Groups.

Age Group	Increase in Digital Literacy (%)	Challenges Encountered	Recommendation
18-25 years	30%	No significant challenges	Continue with the introduction of advanced technology
26-40 years	25%	Some technical difficulties	Adjustment of training materials according to skill level
41-60 years	10%	Difficulties in technology adoption	Need more interactive training methods
>60 years	5%	Resistance to technology	Specialised mentoring and personalised approach

Framework Refinement and Revision Stage

Despite the fact that this research contains many contributions, there are several limitations to be addressed. There are some limitations to this study, first the study in its geographical scope is set only on Bandung City and thus could possess characteristics that may not necessarily represent either Indonesian cities or the world. Accordingly, the utilization of this framework in other regions may necessitate tailored implementations per their local contexts.

Next, although this study was based on a rigorous Design Science Research (DSR) methodology, it was not yet fully evaluated long-term in terms of the impact of the intervention. The long-term effectiveness and sustainability of the resulting changes will need to be further monitored. This is vital so that improved inclusion and access to technology can be maintained beyond the scope of an intervention.

Third, the resistance to technology in some sub-districts, especially among elderly citizens, indicates that training and education approaches need to be tailored and individualized. This study has not delved deeply enough into more innovative interventions that might overcome this resistance, such as more intensive mentoring programs or a much better use of technology.

Publication and Dissemination of Results

By comparing the findings from Bandung City with similar studies in other cities, it can be seen that the technosocialism framework has the potential to be a more inclusive model, which not only improves efficiency but also encourages wider and more equitable participation in society. This research, with a carefully designed methodology and supported by data from BPS Bandung City in 2023 as well as other official sources, was able to produce robust and relevant findings on IT governance in Bandung City. Each stage of the research was designed with a strong empirical foundation and measurable targets, ensuring that the resulting solutions are not only effective but also sustainably applicable across all sub-districts in Bandung City.

The implications of this research clearly show that achieving inclusive IT governance in smart city development requires an approach that integrates social justice with technology. This research paves the way for further studies that could explore the application of this framework in other cities with different characteristics, both within and outside Indonesia.

CONCLUSION

This study yielded an IT governance framework based on the principles of technosocialism to tackle digital inequality in Bandung City. By applying the Design Science Research (DSR) methodology, this research could not only discover the problem of disparities in access to technology from several sub-districts but also design and test practical solutions that were proven to fulfill community access and participation in Smart City, especially in disadvantaged areas such as Gedebage and Cibiru Sub-District. Technosocialism – the provision of enhanced digital infrastructure, tailored digital literacy programs, and cross-sector collaboration – was found to be exceptionally effective in bridging the digital divide.

The findings of this research matter both in theory and practice, as it contributes to the ongoing efforts in academia on social justice with technology efficiency closely related to LIO-related studies and also provides concrete help for city governments create more inclusive policies. The results of this research are a model to overcome the creation of smart cities that can be adapted by other cities in Indonesia and worldwide towards an inclusive nature.

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AUTHOR CONTRIBUTION STATEMENT

Muhammad Rozahi Istambul devised the study and constructed the framework. Parlindungan helped with data collection and analysis. Iwan Rijayana provided supervision and critical review of the manuscript. All authors approved the final version of the manuscript.

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