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Critical Barriers to Realising Inclusive Digital Education in an Urban-Peripheral Context: The Case of Kupang City, Indonesia

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A B S T R A C T

This study examines barriers to implementing inclusive digital education policy in under-resourced, urban-peripheral contexts, focusing on Kupang City in Eastern Indonesia. Despite its urban status, Kupang faces infrastructural fragility, limited institutional capacity, and socio-economic disparities that complicate the translation of national reforms, particularly Merdeka Belajar and the Platform Merdeka Mengajar (PMM), into practice. Using a qualitative single-embedded case study, data were collected through 25 semi-structured interviews with national, municipal, school, and community actors, supplemented by policy documents and statistical records. Guided by Grindle's policy content–context model, Lipsky's street-level bureaucracy theory, and van Dijk's digital inclusion framework, the analysis highlights three interconnected dimensions that sustain policy–practice gaps: governance misalignment, technological deficits, and constrained actor agency and resource support. These produce five barriers: weak coordination, limited teacher capacity, street-level discretion, and reliance on unstable external resources. Findings reveal that limited outcomes are shaped less by isolated technical failures than systemic misalignments, resulting in partial adoption, symbolic compliance, and selective inclusion. The study contributes by extending empirical evidence to an under-researched eastern Indonesian context. It underscores the need for adaptive governance, targeted capacity building, and stable resources to align national ambitions with local realities.

INTRODUCTION

The global shift toward digital education has accelerated dramatically over the past decade, particularly in the wake of the COVID-19 pandemic. Governments and education systems worldwide were forced to migrate to online and blended learning models, exposing both the possibilities and limitations of digital transformation in education. While this transition enabled many learners to continue their education amid school closures, it also revealed sharp inequalities between those who had access to reliable digital resources and those who did not. In this context, the concept of inclusive digital education has emerged as a critical agenda for ensuring that all learners, irrespective of socio-economic status, geography, gender, or physical ability, can meaningfully benefit from technology-enhanced learning opportunities.

Scholars define inclusive digital education not merely as providing access to devices or internet connectivity, but as ensuring equitable participation in learning processes. It involves four interrelated dimensions: access to infrastructure, acquisition of digital skills, meaningful usage of digital platforms, and the achievement of positive learning outcomes (van Dijk, 2005; Wang et al., 2024). These dimensions highlight that inclusion is not automatic; rather, it depends on systemic arrangements that support learners and educators in bridging digital divides. Without careful attention to equity, digital education risks reinforcing existing inequalities instead of mitigating them. As such, researchers increasingly stress the importance of examining both technical and social dimensions of digital reform.

A substantial body of literature has emerged around the theme of **infrastructure and access**. Many studies emphasize that investments in ICT infrastructure and devices are essential for expanding opportunities, but are insufficient to ensure equity. Palvia et al. (2018) demonstrate that large-scale ICT projects often improve formal access to technology. Nevertheless, disadvantaged learners still struggle to translate access into outcomes due to weak local support systems. Similarly, Selwyn et al. (2020) show that digital divides persist in developed contexts, where socio-economic conditions and home environments influence how students engage with technology. These findings underscore that infrastructure is necessary but not sufficient for achieving inclusivity.

The second dominant theme is **teacher digital competence and pedagogy**. Scholars consistently argue that teacher beliefs, confidence, and professional development play a central role in shaping how technologies are adopted in classrooms. Lai & Bower (2019) found that teachers' pedagogical orientations strongly influence whether technology is used to enhance student-centered learning or merely to replicate traditional practices. According to Theodorio (2024), encouraging a meaningful integration of ICT into everyday instruction requires ongoing teacher training and aggressive institutional support. Without adequate support, many teachers approach digital reforms as additional burdens rather than opportunities for innovation. This literature highlights the human dimension of digital education, where capacity and motivation are as important as infrastructure.

A third theme concerns **student equity and outcomes**. Research in both developed and developing countries reveals that socio-economic disparities, geographic location, and gender continue to shape digital inclusion. Livingstone & Helsper (2007) argue that access alone does not guarantee equitable skills development or outcomes, as learners from disadvantaged backgrounds often face structural barriers in using technology effectively. Recent studies reaffirm this pattern, showing that while device ownership has expanded globally, meaningful

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engagement with digital platforms remains stratified along socio-economic lines (Wang et al., 2024). This strand of research underscores that inclusive digital education must address broader social inequalities alongside technical provision.

Despite the richness of these three themes, one area remains relatively underexplored: governance and policy implementation in digital education. Unlike the abundant literature on infrastructure, teacher competence, and student equity, relatively few studies examine how governance arrangements, fiscal capacity, and policy execution influence outcomes. Asmawa et al. (2024) said that in many developing nations, insufficient legislative frameworks, weak governance structures, and low institutional capacity all work against digital changes, making it difficult for them to be implemented effectively. Similar to this, Zainal & Zainuddin (2020) discovered that Malaysia's top-down ICT efforts, such as the Frog Virtual Learning Environment and Smart Schools, had differing degrees of success because they failed to adequately take into account the demands of stakeholders at the micro level. Chile's Enlaces program, which after 25 years lost its capacity to offer pertinent answers to educational digitalization concerns, serves as another example of the failure of standardized approaches. Claro & Jara (2020). Unwin et al. (2020) note that in Sub-Saharan Africa, digital reforms collapsed where frontline implementers lacked discretion, support, and resources to adapt policies to their environments.

Research in Indonesia also reveals persistent governance challenges, though few studies focus directly on digital education. According to Rusdinal et al. (2025), the implementation of digital education policies depends on strong organizational structures and efficient communication. Similarly, governance flaws in digitalization efforts specifically, sectoral egos and vertical misalignments that impede local-level implementation are exposed by Ramadani et al. (2022). In addition to highlighting structural constraints in rural places where inadequate internet access makes virtual learning more difficult. Prahmana et al. (2021) suggest community radio-based blended learning as a workable substitute. These findings suggest that the governance dimension, particularly in peripheral contexts, plays a critical role in shaping educational outcomes. Nevertheless, systematic research on this topic, especially in relation to digital reforms, remains scarce.

The limited scholarship in this area points to an important gap in the literature. While we know much about devices, infrastructure, and teacher training, we know far less about how governance misalignments, fiscal rigidity, and street-level discretion constrain the realization of inclusive digital education. This imbalance is striking given that policy design and implementation are central to translating national ambitions into local practices. The few existing studies point to recurring issues, rigid top-down directives, lack of contextual adaptation, and unstable resource flows, but they do not sufficiently explain how these factors interact in peripheral urban settings.

This study seeks to address that gap by focusing on Kupang City, the capital of East Nusa Tenggara (NTT) Province in Eastern Indonesia. Although classified as urban, Kupang retains many infrastructural and institutional characteristics of peripheral localities, such as unreliable internet connectivity, outdated hardware, and fragmented governance. These conditions make it an ideal case to explore how national digital reforms, embodied in *Merdeka Belajar* and the Platform *Merdeka Mengajar* (PMM), confront the realities of resource-constrained urban-peripheral environments. By analyzing this case, the study provides insights not only into Indonesia's education reforms but also into broader challenges faced by peripheral regions worldwide.

Although international scholarship has increasingly acknowledged the role of governance in educational reform, most studies remain concentrated in metropolitan or relatively well-resourced regions. Influenced by transnational frameworks, policy study in Norway, Ireland, and Spain demonstrates convergence toward shared conceptions of digital competency (McGarr et al., 2021). Although there are still obstacles, such as competency gaps and problems with classroom management, teacher ICT integration in Luxembourg is linked to attitudes, subjective norms, self-efficacy beliefs, enabling conditions, value beliefs, and pedagogical views (Ivanishchenko et al., 2024). However, these findings emerge from contexts where infrastructure and fiscal capacity are already strong, limiting their applicability to peripheral or under-resourced areas. Similarly, research from OECD countries often emphasizes the refinement of governance systems rather than their fundamental fragility (OECD, 2021). It creates a significant gap in our understanding of how governance functions when institutions are weak, resources are limited, and reforms are highly centralized.

Studies in the Global South provide important but still partial insights. Trucano (2016) notes that international ICT programs in Africa and Asia frequently adopt one-size-fits-all approaches, with limited adaptation to local capacity constraints. Unwin et al. (2020) confirm that without supportive governance mechanisms, technology distribution alone rarely produces sustainable outcomes. In Latin America, Peruzzo & Allan (2024) emphasize that even with ambitious federal policies, inequities persist where local governments lack discretion and fiscal resources to contextualize reforms. These studies highlight recurring governance bottlenecks but often stop short of systematically analyzing how they interact with frontline practices in schools.

In the Indonesian context, research on governance and digital education is still emerging. Although Indonesia has made significant investments in digital platforms under Merdeka Belajar, the advantages are still not uniformly spread, with rural and peripheral regions falling behind, as noted by Hazin et al. (2025) and Kartiasih et al. (2023). According to Indrawati & Kuncoro (2021), Indonesia's human capital development plan recognizes the need to enhance access, quality, and institutional collaboration while also acknowledging the ongoing shortages in infrastructure and human resource capability in education. Collectively, these studies suggest that Indonesia's reforms confront governance and capacity challenges. However, they do not yet fully explain how these dynamics play out in urban-peripheral contexts such as Kupang City.

The gap, therefore, is not simply an absence of research but a lack of integration across three critical dimensions: governance structures, technological infrastructure, and actor-level capacity. Existing studies tend to emphasize one dimension at the expense of the others, resulting in partial explanations. Few works explore how these factors interact to produce specific patterns of adoption, compliance, or exclusion. In particular, the role of street-level actors: teachers, principals, and local officials, remains underexplored, despite their centrality in mediating policy and practice. This oversight is significant because street-level discretion often determines whether reforms are translated, adapted, or resisted in practice (Lipsky, 2010).

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To address this gap, the present study integrates three theoretical perspectives. Grindle (2017) policy content–context model provides a lens for analyzing how institutional and socio-political factors shape implementation outcomes. Lipsky (2010) theory of street-level bureaucracy highlights the discretionary practices of frontline actors in adapting centrally designed policies to local contexts. Digital inclusion framework conceptualizes inclusion as multidimensional, encompassing access, skills, usage, and outcomes (Jan A.G.M. van Dijk, 2020; van Dijk, 2005). By combining these perspectives, this study develops a multidimensional framework that treats barriers as interdependent rather than isolated, thereby offering a systemic explanation for why inclusive digital education reforms falter in peripheral contexts.

This integrative approach also underscores the novelty of the research. Whereas previous studies often examined access, competence, or governance in isolation, this study demonstrates how these dimensions interact in a specific case. The novelty is twofold: empirically, it extends the evidence base by focusing on Kupang City, an under-researched urban-peripheral locality in Eastern Indonesia; theoretically, it advances the literature by showing how governance misalignment, infrastructural fragility, and constrained actor agency collectively sustain the policy–practice gap. Such contributions are particularly valuable because they challenge the assumption that digital reforms can be scaled uniformly across diverse contexts, highlighting instead the need for adaptive and context-sensitive strategies.

The significance of this research extends beyond the Indonesian context. Peripheral urban settings like Kupang exist across the Global South, from peri-urban settlements in India to provincial towns in Sub-Saharan Africa and Latin America. In all these cases, national ambitions for digital inclusion confront local realities marked by resource scarcity, governance fragmentation, and uneven capacity. By situating Kupang within this broader landscape, the study not only provides insights for Indonesia but also contributes to comparative debates on digital education reforms in peripheral regions globally. The findings thus have the potential to inform both international scholarship and policy design.

Against this backdrop, Kupang City provides a compelling site for examining how national digital education reforms unfold in peripheral urban contexts. Although officially classified as an urban municipality, its socio-economic profile and infrastructural conditions more closely resemble those of rural areas. Internet connectivity is unreliable, digital hardware is outdated, and fiscal capacity at the municipal level is limited. Teacher digital competence is uneven, with significant gaps between public and private schools, and governance coordination remains fragmented across national, provincial, and local levels. These conditions illustrate the paradox of urban-peripheral settings: formally urban, yet constrained by peripheral realities that shape the translation of national reforms.

The purpose of this study is to investigate the barriers that hinder the realization of inclusive digital education in Kupang City and to explain how these barriers interact to shape policy outcomes. Rather than treating obstacles as discrete issues, the study examines them as interdependent dimensions, governance structures, technological infrastructure, and actor agency with resource support, that collectively sustain gaps between national ambition and local practice. This approach allows for a more systemic understanding of why digital reforms produce partial adoption, symbolic compliance, and selective inclusion in peripheral contexts.

The study contributes to the literature in several ways. First, it provides an empirically grounded analysis of inclusive digital education in Eastern Indonesia, a region rarely represented in global scholarship. By documenting the specific barriers faced in Kupang City, the study expands the empirical base of digital inclusion research. It situates Indonesia within comparative debates on education reform in peripheral regions. Second, it advances theoretical integration by bringing together policy implementation theories, street-level bureaucracy, and digital inclusion frameworks. This integration is novel because it bridges fields that have often developed in parallel, offering a multidimensional framework for analyzing how systemic and actor-level mechanisms interact in shaping outcomes. Third, it generates policy-relevant insights by identifying practical strategies for aligning national ambitions with local capacities, including the need for adaptive governance, context-sensitive teacher capacity building, and stable resource flows.

In sum, this study positions Kupang City as a critical case for understanding why ambitious digital education reforms often falter in under-resourced urban-peripheral settings. It demonstrates that the barriers are not isolated technical failures but systemic misalignments embedded in governance, infrastructure, and actor-level capacities. By addressing these gaps, the research contributes to both scholarly debates and policy efforts, offering lessons that extend beyond Indonesia to similar contexts across the Global South.

The structure of this research is as follows: methods, results and discussion, and conclusions.

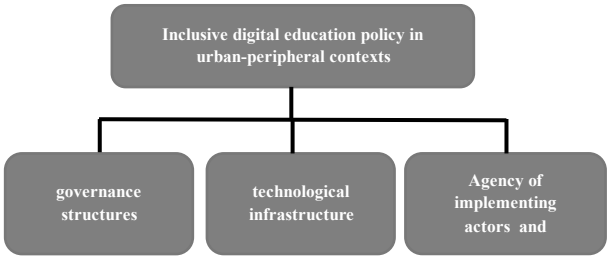

Figure 1. Theoretical framework
Source: Authors' construct, 2024

METHOD

This study adopts a qualitative single-embedded case study to examine how inclusive digital education policy is implemented in Kupang City, an urban-peripheral context in Eastern Indonesia. The choice of method is grounded in the need to capture in-depth perspectives, contextual nuances, and multi-level dynamics, elements that are often missed by purely quantitative designs (Creswell, 2018). In this design, the unit of analysis is policy implementation as experienced by actors across levels of governance, allowing us to trace how governance structures, institutional constraints, and frontline discretion jointly shape outcomes.

Case selection was purposive and theory-informed. Although administratively urban, Kupang exhibits peripheral characteristics, unstable connectivity, limited and outdated digital devices in schools, uneven teacher digital competence, and high poverty, making it an informative setting to study the translation of national reforms into local practice. The city has been a target of MoECRT's *Merdeka Belajar* and *Digitalisasi Sekolah*

initiatives, yet available statistics and field accounts indicate a notable implementation gap. These features position Kupang as a critical case for understanding why ambitious digital inclusion agendas can yield partial adoption, symbolic compliance, and selective inclusion.

Informants selection followed purposive sampling to ensure coverage from policy design to classroom practice, producing a total of 25 informants. The sample comprised national-level MoECRT officials, municipal education office personnel and supervisors, school-level actors including public and private principals, teachers, and IT coordinators, as well as NGO representatives and community leaders/parents (see Table 1). This composition ensured that the study captured perspectives on design, interpretation, and street-level implementation, and it enabled cross-checking narratives across governance layers.

Table 1. Informants

Actor Category	Sub-Category	Role/Institution	Number of Informants
National-Level Actors	MoECRT	Digital education program officials	2
Local Government Actors	Kupang City Education Office	Head of Office and division heads	3
	Local government school supervisors	Supervisory and monitoring roles	2
School-Level Actors	Public school principals	Junior secondary schools	4
	Private school principals	Low-income community schools	2
	Public and private school teachers	Digital pedagogy practitioners	6
	IT coordinators	School-level tech implementers	2
Community and External Actors	NGOs and education activists	Education equity programs	2
	Community leaders and parents	Local perspectives on access/inclusion	2

Source: Primary Data, 2025

Primary data were collected through semi-structured interviews guided by an interview protocol that probed governance arrangements, infrastructure readiness, teacher capacity, and day-to-day enactment of the Platform *Merdeka Mengajar*. Interviews were conducted in person and online (Zoom/WhatsApp), lasted approximately 45–60 minutes, were audio-recorded with informed consent, transcribed verbatim, and anonymized to safeguard confidentiality. Secondary data included MoECRT guidelines, municipal education statistics, and field notes from site visits, which were systematically compiled to support triangulation; data collection continued until thematic saturation was reached.

Data analysis employed qualitative content analysis supported by NVivo 12 in three iterative phases. First, open coding identified recurrent concepts (e.g., infrastructure deficits, teacher digital literacy, top-down communication), preserving informant language where appropriate. Second, axial coding assembled these codes into broader themes such as governance misalignment, capacity gaps, frontline discretion, policy communication frictions, and contextual adaptation. Third, selective coding connected themes to the study's analytical lenses, Grindle's content–context model, Lipsky's street-level bureaucracy, and van Dijk's digital inclusion framework, enabling pattern matching across system-level and actor-level mechanisms; triangulation of interviews, documents, and statistics, alongside analytic memos and an audit trail, reinforced credibility and coherence of the conclusions.

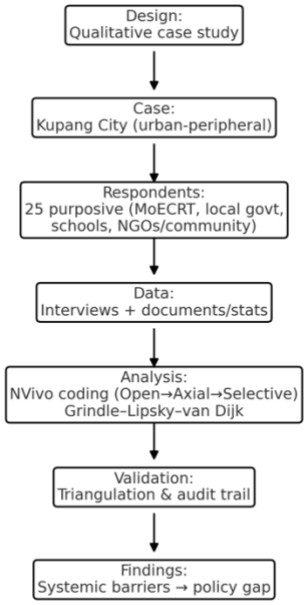

Figure 2. Research Methodology Flow
Source: Authors' construct, 2025

RESULTS AND DISCUSSION

This study examines barriers to inclusive digital education policy in under-resourced urban-peripheral contexts, using Kupang City as a case. Guided by Grindle's policy content–context model, Lipsky's street-level bureaucracy theory, and van Dijk's multidimensional digital inclusion framework, the analysis shows that three interrelated dimensions drive implementation gaps (see Figure 3. Dimensions Driving Implementation Gaps in Inclusive Digital Education Policy in Kupang City): misaligned governance structures, inadequate technological infrastructure, and constrained actor agency and resource support. Together, these factors create a fragmented implementation environment, narrowing the digital divide only selectively and fostering adaptive strategies shaped more by necessity than design.

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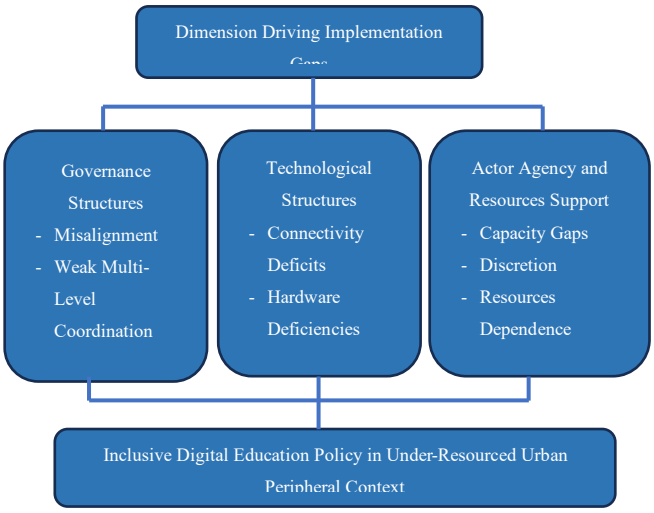


Figure 3. Dimensions Driving Implementation Gaps in Inclusive Digital Education Policy
Source: Authors' construct, 2025

Governance Structures: Misalignment and Weak Multi-Level Coordination

This subsection analyzes how governance structures shape the implementation of inclusive digital education in Kupang City and demonstrates how systemic misalignments directly constrain policy outcomes. Rather than treating governance as an abstract concept, the analysis is grounded in the lived realities of policy actors, school practices, and fiscal arrangements, ensuring that the research questions are answered through evidence and analysis.

Field findings reveal that the most persistent obstacle is the vertical misalignment between centrally designed frameworks and the actual capacity of local institutions. Under the *Merdeka Belajar* agenda and the Platform *Merdeka Mengajar (PMM)*, national policies assume a baseline of infrastructure readiness, fiscal flexibility, and teacher competence. However, municipal education statistics show that 42% of public schools in Kupang operate with unstable internet connections and 29% face frequent electricity interruptions (BPS Kota Kupang, 2023). As summarized in Table 2, these infrastructural weaknesses highlight the fragility of the local system, undermining national assumptions about baseline readiness.

Table 2. Internet Connectivity and Electricity Reliability in Public Schools, Kupang City (2023)

Indicator	Percentage of Schools	Number of Schools (n=35)
Stable internet connection	58%	20
Unstable internet/ intermittent access	42%	15
Reliable electricity (daily availability)	71%	25
Frequent electricity interruptions	29%	10

Source: Primary Data, 2025

Interview data reinforce this misalignment. A senior education office official remarked: "*The central government gives us the modules and targets, but they are made for places with better internet and more training. Here, we have to adjust quietly on our own.*" (Informant 7, interview, 14 July 2023). School observations confirmed that PMM modules were downloaded monthly and shared via USB drives rather than accessed online. Similar patterns have been reported in Sub-Saharan Africa, where offline workarounds became the default in low-connectivity environments (Hennessy et al., 2022).

Horizontal coordination failures further compound the problem. National guidelines encourage collaboration between schools, NGOs, and municipal agencies, yet minutes from a July 2023 coordination forum show that 70% of agenda items focused on compliance reporting instead of problem-solving. It aligns with Humes (2022), who contends that government bureaucratic demands undermine educational goals by demonstrating how overbearing administrative frameworks may stifle genuine cooperation. In Kupang, the researcher's documentation revealed three schools independently launching similar device-donation programs without coordination, wasting scarce resources.

Ambiguity across governance levels introduces additional constraints. Teachers reported contradictory expectations regarding lesson plan submissions: weekly on the PMM platform, monthly from the municipal office, and once per semester from school principals. Policy circulars confirmed these inconsistencies, reflecting what Lipsky (2010) described as street-level ambiguity, forcing teachers to exercise discretion without clear institutional backing. Coherence is frequently weakened by conflicting directives and diminished local authority ability, as demonstrated by comparable studies of middle-tier governance in England, which show how overlapping reforms and changing institutional roles result in uneven and fragmented implementation across local education systems (Greany, 2020).

Fiscal constraints reveal a deeper imbalance between responsibility and resources. In 2023, only 3.8% of Kupang's municipal education budget was allocated to digital infrastructure, well below the 10% national recommendation. As illustrated in Figure 4, the majority of funds were absorbed by salaries and general operations, leaving little fiscal space for digital initiatives.

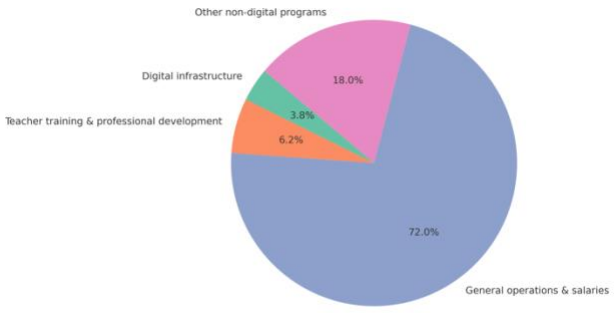


Figure 4. Allocation of Municipal Education Budget, Kupang City (2023)
Source: Kupang City Education Office (2023)

As one official explained: "*We cannot run a digital inclusion program if we cannot even guarantee electricity in all schools.*" (Informant 5, interview, 10 July 2023). School records further showed that 21 of 35 schools relied on NGO grants or parental fundraising to cover internet costs, deepening inequalities between affluent and low-income communities.

These results support Gustafsson (2022) finding that smaller towns frequently lack the financial and organizational resources

necessary to effectively implement national digitalization mandates locally. Similarly, Ramadani et al. (2022) point out how Indonesia's governance systems' vertical asymmetry and misalignment limit local implementation and produce structural injustices. Viewed through Jan A.G.M. van Dijk (2020) digital inclusion framework, misaligned governance undermines all four dimensions of inclusion: access, skills, usage, and outcomes.

From a comparative perspective, this study not only confirms prior concerns about the limits of centralized reforms in low-resource contexts (Piattoeva & G. Gurova, 2020) but extends them by demonstrating how fiscal rigidity and horizontal fragmentation reinforce vertical misalignment. The contribution lies in identifying the interlocking nature of contradictory directives, symbolic coordination, and fiscal immobility, which together create a governance trap that structurally distorts digital education reforms.

Technological Infrastructure: Digital Divide in Connectivity and Hardware Deficits

This subsection examines how deficits in connectivity and hardware limit the implementation of inclusive digital education in Kupang City. Rather than treating technological infrastructure as a neutral background, the findings demonstrate how infrastructural fragility directly shapes the nature and quality of digital learning practices. Following van Dijk (2020) and the OECD (2021), infrastructure is understood as the foundation of inclusion. Without stable internet, functional devices, and institutionalized support, even skilled teachers and ambitious reforms cannot deliver transformative outcomes.

Connectivity gaps are among the most persistent barriers. As of 2022, only 39.4% of junior secondary schools reported stable internet connections, while 60.6% relied on unstable or intermittent access (Dinas Pendidikan Kota Kupang, 2022). Bandwidth was typically insufficient to support simultaneous classroom use. Table 3 summarizes these deficits, underscoring the system's structural vulnerability.

Table 3. Internet Connectivity in Junior Secondary Schools, Kupang City (2022)

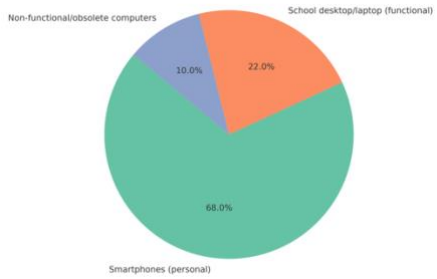
Connectivity Condition	Percentage of Schools	Number of Schools (n=33)
Stable connection	39.4%	13
Unstable / intermittent	60.6%	20

Source: Kupang City Education Office (2022); field data

Interview accounts confirm these statistics. One IT coordinator noted: *"We can have internet today, and tomorrow it will be gone for the whole day. Sometimes, during PMM training, half of us cannot log in because the connection just dies."* (Informant 14, interview, 25 July 2023). This pattern mirrors findings from Sub-Saharan Africa, where unreliable bandwidth undermined the integration of digital reforms (Hennessy et al., 2022).

Hardware deficits compound connectivity challenges. Many schools operate with outdated or broken computers, forcing teachers to depend on personal smartphones during training and classroom use. One teacher reflected: *"When we do PMM training, we use our phones. The school has computers, but they are too slow or broken."* (Informant 07, interview, 20 July 2023). This reliance on personal devices introduces financial burdens and widens equity gaps between students and teachers with high-spec devices versus those with only basic models. Similar inequalities have been documented in South Asia, where personal smartphones substituted for institutional hardware, limiting equitable learning outcomes (Unwin et al., 2020). Figure 5 visualizes this disparity, illustrating that smartphones dominate access while laptops and functional school computers remain scarce.

Figure 5. Primary Devices Used for Digital Learning in Public



Junior Secondary Schools, Kupang City (2023)
Source: Teacher interviews; school inventory records (2023)

Teacher readiness magnifies these disparities. Private schools, typically with prior investments, display higher levels of digital competence, while many public school teachers, especially senior staff, struggle with basic PMM operations. As one supervisor observed: *"Some teachers are still afraid to click the wrong button. They think they will break the system. So, instead of trying, they ask others to do it for them."* (Informant 05, interview, 15 July 2023). It confirms Lai & Bower (2019) claim that confidence is as decisive as competence in technology adoption.

Institutional support mechanisms remain underdeveloped. Most public schools lack dedicated IT staff, leaving coordinators who double as administrative or teaching staff overstretched. As a result, minor technical failures lead to abandonment of digital tools. It reflects international findings that without institutionalized technical support, infrastructure remains chronically underused (Hennessy et al., 2022). Al-Mamary (2022) found that Yemeni teachers' usage of technology is greatly impacted by the availability of technical support teams and simple access to ICT infrastructure.

Student home access further reproduces inequality. While some urban households can provide devices, many cannot, forcing teachers to revert to printed materials. One teacher explained: *"If I give assignments through PMM, only some students can do them at home. So, I end up printing them for the rest."* (Informant 09, interview, 21 July 2023). It reflects van Dijk's (2020) argument that unequal access undermines the equity goals of digital education, creating hybridized and inconsistent practices.

Finally, these deficits produce ritualistic rather than substantive engagement. A school principal admitted: *"We do PMM because it is required. However, the internet is too slow, and teachers lack time to explore the content. So, it becomes more about showing that we use it, not using it for learning."* (Informant 03, interview, 14 July 2023). It reflects Meyer & Rowan (2021) theory of symbolic compliance, where formal adherence masks the absence of meaningful adoption.

In sum, Kupang's infrastructural weaknesses are not temporary inconveniences but systemic barriers that constrain the transformative potential of digital education. They validate global findings from Africa and South Asia (Unwin et al., 2020), extend them by showing how infrastructure interacts with teacher readiness to create compliance-over-pedagogy patterns, and contribute new insights by mapping how infrastructural

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fragility in an urban-peripheral Indonesian city systematically shapes selective and symbolic platform use. Without integrated interventions, combining connectivity upgrades, reliable hardware provision, teacher confidence-building, and embedded support systems, digital inclusion will remain largely symbolic rather than transformative.

Actor Agency and Resource Support: Capacity Gaps, Discretion, and Resource Dependence

This third subsection examines the dimension of actor agency and resource support in implementing the inclusive digital education policy in Kupang City. In this context, actor agency refers to the capacity of frontline implementers, primarily teachers, principals, and school-based IT coordinators, to interpret, adapt, and enact policy within the constraints of their institutional and local environments. Resource support encompasses the material and institutional resources available to sustain digital learning, including training, mentoring, funding, and technical assistance. Following Lipsky (2010) theory of street-level bureaucracy, the analysis foregrounds how agency is shaped by capacity gaps, policy ambiguity, and the precariousness of external resource flows, which influence the alignment between national policy aspirations and local pedagogical realities.

Teacher Capacity Gaps and Street-Level Adaptation

One of the most significant constraints on realizing inclusive digital education in Kupang City lies in persistent and multi-layered teacher capacity gaps. These deficits go beyond digital pedagogy to encompass the adaptive strategies employed by street-level actors who navigate scarce resources and ambiguous directives. While national reforms envision teachers as empowered facilitators of learner-centered education, our findings reveal that many operate more like Lipsky (2010) street-level bureaucrats, selectively reinterpreting policy mandates according to local constraints.

Heterogeneity in competence was striking. Public junior secondary school teachers, especially in low-income schools, reported minimal exposure to structured digital training. As one teacher noted: *"I learned how to use PMM from a colleague, not from formal training. Even now, I am not confident I use it the right way."* (Informant 06, interview, 18 July 2023). This reliance on peer-to-peer learning mirrors findings from other low-resource systems, where sporadic formal training forces teachers to depend on informal networks (Hatlevik & Christophersen, 2013). While adaptive, these networks risk reproducing disparities, as knowledge transfer depends on individual peers rather than standardized frameworks.

Table 4. Teacher Training Experiences in Kupang Junior Secondary Schools (2023)

Training Modality	Share of Teachers (n=60)	Reported Effectiveness
Formal PMM training (one-off)	42%	Low (theoretical focus)
Peer-to-peer/colleague support	68%	Moderate
Informal WhatsApp groups	53%	High (practical focus)
Sustained mentoring/coaching	15%	Very low availability

Source: Teacher interviews and survey, 2024

As Table 4 shows, the majority of teachers rely on peer or informal mechanisms, while only a minority have access to sustained mentoring. It confirms that OECD (2021) and UNESCO (2022) report that capacity-building in peripheral settings remains fragmented and inconsistent.

The content and delivery of official PMM training also emerged as problematic. Teachers described sessions as one-off, overly theoretical, and disconnected from infrastructural realities. A principal explained: *"The training assumes stable internet in classrooms, which is not true for us. Teachers leave motivated but cannot apply it."* (Informant 02, interview, 14 July 2023). It echoes Lai & Bower (2019) concept of "implementation disconnect," where reforms are built on idealized assumptions of readiness rather than local realities. Without follow-up coaching, even motivated teachers often reverted to traditional methods when faced with technical obstacles, a regression also reported in other Global South contexts (Admiraal et al., 2017; Unwin et al., 2020).

Workload pressures compounded these constraints. Teachers reported balancing heavy teaching loads, administrative duties, and extracurricular responsibilities, leaving little time to explore new tools. One remarked: *"We already have so many reports. Learning PMM feels like an extra job, not part of teaching."* (Informant 11, interview, 21 July 2023). It reflects Fullan et al. (2021) warning on "change fatigue," where reforms falter when new demands are layered onto already stretched teachers.

Street-level adaptation emerged as both a survival strategy and a distortion of policy. Many teachers engaged with PMM symbolically, uploading lesson plans or logs to satisfy reporting while teaching face-to-face. A supervisor summarized: *"This is symbolic compliance. It is about paperwork, not pedagogy."* (Informant 05, interview, 15 July 2023). It reflects Meyer & Rowan (2021) institutional theory of legitimacy without substantive change.

Other adaptive practices included hybridizing methods. Teachers projected PMM content during lessons but distributed printed assignments for homework, accommodating unequal home internet access. It demonstrated commitment to inclusion but diluted PMM's transformative intent, relegating it to a supplementary role. Van Dijk (2020) cautions that fragmented integration risks reducing digital platforms to peripheral resources rather than central pedagogical tools.

Peer-driven networks played an important role. Informal WhatsApp groups provided quick, practical support for troubleshooting and lesson-sharing. As an IT coordinator noted: *"This is the real training, practical and from people who know our situation."* (Informant 14, interview, 25 July 2023). Nevertheless, their reach was uneven; teachers with limited digital literacy or weaker professional ties often remained excluded, reinforcing inequalities (Hatlevik et al., 2015).

Attitudinal gaps also mattered. Younger teachers and those in private schools embraced digital learning, while many veteran public school teachers expressed skepticism. One senior teacher remarked: *"Digital learning is good for some subjects, but here, with our facilities, it is not realistic."* (Informant 08, interview, 19 July 2023). It aligns with Ertmer & Ottenbreit-Leftwich (2010), who argue that beliefs and attitudes are as decisive as competence.

The interaction of limited skills, ambiguous directives, and uneven support created a reinforcing cycle: capacity gaps drove minimalist engagement; fragmented guidance enabled selective

compliance; and weak institutional mentoring limited skill diffusion. As Lipsky (2010) predicts, street-level actors redefined policy to fit operational realities. In Kupang, this produced a pattern that was adaptive in form but shallow in substance.

In comparative perspective, these findings confirm international studies documenting barriers in peripheral urban contexts (OECD, 2021; UNESCO, 2022; Hennessy et al., 2022) and extend them by showing how capacity gaps intertwine with governance ecology and peer networks. The novel contribution of this study lies in revealing how symbolic compliance and selective engagement with PMM emerge not only from resource deficits but from the discretionary adaptations of teachers themselves. Thus, while PMM is formally present, its pedagogical integration remains fragmented, contingent on ad hoc adaptations and the initiative of educators navigating urban-peripheral constraints.

Ambiguity and Discretion at the Street Level

Findings from this study indicate that policy ambiguity constitutes one of the most significant barriers to realizing inclusive digital education in Kupang City, particularly within the dimension of governance structures. In formal terms, the governance framework of the *Merdeka Belajar* reforms and the *Platform Merdeka Mengajar* (PMM) is designed to provide clear and vertically coordinated guidance, from the Ministry of Education, Culture, Research, and Technology (MoECRT) at the national level, to city-level education offices, and finally to school principals and teachers at the frontline. However, field evidence reveals a sharp disjuncture between policy design and street-level interpretation, producing what Matland (1995) categorizes as a *low consensus–low clarity* implementation context.

Teachers and principals reported receiving conflicting instructions regarding the frequency with which lesson plans or teaching materials must be uploaded to PMM. As summarized from multiple interviews: "*PMM says upload lesson plans every week, the city office says only once a month, and the principal says just once per semester. Which one should I follow?*" (Informant 17, interview, 29 July 2023). Such inconsistencies prompt teachers to exercise discretion, often opting for the least burdensome requirement or aligning with the expectations of the most immediate supervisory authority. This pattern affirms Lipsky's (2010) observation that discretion is an inevitable feature of street-level work, especially when policies are vague, contradictory, or both.

In addition to substantive contradictions, policy communications in Kupang are frequently delivered with very short notice, sometimes only days before a reporting deadline, through informal channels such as WhatsApp, and often contain technical jargon inaccessible to teachers with low levels of digital literacy. As reflected in the accounts of several principals: "*The instructions often use language as if for IT experts, not for teachers. So, we end up guessing what it means*" (Informant 03, interview, 14 July 2023). These barriers are particularly salient when viewed through the lens of Hill & Hupe (2021) findings that implementer capacity mediates the effects of policy clarity: in better-resourced private schools, ambiguity was less problematic because teachers could draw on their own initiative and technological competence; in capacity-constrained public schools, however, ambiguity compounded existing barriers, widening the policy–practice gap.

In several cases, ambiguity contributed to what academics refer to as policy drift, which is a slow change in the perception and implementation of policies over time (Godziewski, 2020). In Kupang, this drift is evident in how PMM's orientation shifted from fostering pedagogical innovation to serving primarily as a tool for *symbolic compliance* Meyer & Rowan (2021), where teachers engaged with the platform to meet administrative reporting requirements rather than transform classroom instruction. As one composite account from multiple interviews noted: "*We do PMM because it is required. However, the internet is too slow, and teachers lack time to explore the content. So, it becomes more about showing that we use it, not using it for learning.*" (Informant 03, interview, 14 July 2023).

These findings confirm prior research on the impact of policy ambiguity on street-level discretionary behavior (Lipsky, 2010; Matland, 1995) and complement studies emphasizing the importance of consistent, responsive policy communication as a prerequisite for successful educational technology adoption (Tondeur et al., 2021). However, the present study also offers a novel contribution: it demonstrates how policy ambiguity interacts synergistically with technological infrastructure deficits and teacher capacity gaps to form a mutually reinforcing feedback loop of implementation constraints. Whereas previous studies have tended to analyze governance failures and infrastructural limitations as separate dimensions, the evidence from Kupang shows that in *urban-peripheral* contexts, these dimensions are deeply intertwined, such that weaknesses in one exacerbate weaknesses in the other, amplifying the misalignment between policy ambitions and everyday educational practice.

Resource Dependence and Sustainability Concerns

A persistent barrier to realizing inclusive digital education in Kupang City is the chronic dependence on unstable and externally sourced funding streams. While national frameworks such as *Merdeka Belajar* and the Platform *Merdeka Mengajar (PMM)* assume stable resource availability, our findings reveal that local implementation often relies on fragile, ad hoc, and short-term sources of support. These include donor-funded pilot projects, sporadic NGO assistance, and voluntary parental contributions, all varying in scope, reliability, and sustainability.

Interviews with municipal education officials consistently highlighted budget shortfalls. As one remarked: "*We cannot run a digital inclusion program if we cannot even guarantee electricity in all schools.*" (LocalGov-01, interview, 10 July 2023). This finding aligns with West & Lakhani (2022), who argue that decentralization in low-resource contexts devolves responsibilities without adequate fiscal transfers, creating structural imbalances between policy mandates and means of execution.

School-level evidence further underscores the fragility of funding. Internet subscriptions, device procurement, and maintenance are frequently financed through parent associations. Schools in more affluent neighborhoods sustain digital initiatives, while those serving poorer communities depend on uncertain NGO aid. One principal explained: "*When parents cannot contribute, we wait for NGO help. Sometimes it comes, sometimes not. We cannot plan on it.*" (Principal-02, interview, 18 July 2023). This disparity reflects the "second-level digital divide" (Warschauer & Matuchniak, 2010), where access exists formally but quality and continuity depend on socio-economic context.

Table 5. Sources of School-Level Funding for Digital Education, Kupang City (2023)

Funding Source	Share of Schools (n=35)	Reliability
Local government allocations	100%	Low (below needs)

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Parent contributions	57%	Uneven, income-based
NGO/donor projects	43%	Short-term/project
School self-generated revenues	29%	Minimal

Source: Interviews with principals; municipal budget data (2023)

This table 5 highlights that while all schools receive local allocations, these are inadequate, and over half rely on parental funding, reinforcing inequities between wealthy and poor catchment areas.

Project-based NGO assistance exacerbates the challenge. As one NGO actor noted: *"Our funding cycles are annual. We train teachers this year, but if the project ends, there is no budget for follow-up."* (NGO-01, interview, 20 July 2023). This discontinuity undermines capacity-building, echoing Trucano's (2016) critiques of pilot project dependency. Teacher training gains remain ephemeral without long-term support.

Fiscal uncertainty also shapes institutional choices. Schools delay investments in devices or premium educational software due to unpredictable funding. This study reproduces Bulman & Fairlie (2016) conclusion that sustained and predictable resource flows are essential to maximizing the benefits of digital interventions. The novelty of this study lies in showing how fiscal precarity interacts with teacher capacity gaps and policy ambiguity, producing a compounded constraint that locks schools into short-termism.

Resource dependence restricts local adaptation. Even when municipal authorities attempt to localize PMM modules, their efforts are curtailed by budget ceilings that prevent investments in contextualized content, mentoring programs, or offline solutions for low-connectivity areas. Comparative evidence confirms that fiscal incapacity often undermines otherwise feasible adaptations (Hennessy et al., 2022).

From a governance perspective, the problem reflects a misalignment between decentralized service delivery and centralized fiscal control. According to Castelnovo & Sorrentino (2024), local governments are usually viewed as agents entrusted with carrying out centrally determined priorities in multi-level governance systems, which leaves little room for independent decision-making. In Kupang, ambitious digital inclusion targets are set nationally, but sustained financial transfers to achieve them are absent, creating what West & Lakhani (2022) call an "incomplete decentralization" trap.

The implications are severe. In the absence of stable, locally controlled funding, digital inclusion risks becoming episodic and donor-dependent rather than systemic. Over time, this erodes teacher and community confidence, fostering what Dan Honig & Lant Pritchett (2019) term "isomorphic mimicry", reforms that appear compliant externally but lack deep institutionalization.

In sum, Kupang's reliance on external and unpredictable funding mirrors international evidence (UNESCO, 2022; OECD, 2021) that fiscal stability is central to sustaining digital reforms. This study extends the literature by empirically mapping how fiscal precarity interacts with governance misalignments and teacher capacity gaps in an urban-peripheral Indonesian context. The chronic volatility of funding not only widens inequities between schools but also constrains long-term planning, institutional learning, and pedagogical innovation. As such, the inclusive ambitions of Indonesia's digital education policy remain vulnerable to donor cycles and uneven community capacity, rendering reforms fragile and symbolic rather than transformative.

CONCLUSION

The findings of this study highlight that the uneven implementation of inclusive digital education in Kupang City stems from systemic misalignments rather than isolated technical failures. Weak multi-level coordination and rigid, top-down directives limited governance adaptability; unstable internet connectivity, obsolete hardware, and absent support systems constrained infrastructure readiness; and persistent gaps in teacher capacity, combined with contradictory instructions and fiscal precarity, fostered symbolic compliance and selective use of the Platform Merdeka Mengajar (PMM). Together, these factors reveal how national ambitions for digital inclusion are reshaped into fragmented practices when filtered through the realities of peripheral urban contexts.

A preliminary argument advanced here is that inclusive digital education will remain largely symbolic unless reforms explicitly integrate governance flexibility, infrastructural resilience, and sustained investment in teacher capacity. The evidence shows that these three dimensions are interdependent: infrastructural upgrades without teacher readiness yield minimal impact; teacher training without stable resources cannot be sustained; and governance reforms without fiscal decentralization risk locking local actors into compliance rather than innovation.

This study also demonstrates that frontline discretion, while adaptive, often translates into practices that dilute policy intent. Teachers in Kupang blended digital and non-digital methods to accommodate inequities, relied on peer-to-peer learning networks in the absence of systematic training, and selectively engaged with PMM to meet reporting requirements. These adaptations underscore the agency of local actors but also highlight how resource and capacity deficits channel discretion toward survival strategies rather than pedagogical transformation.

From a theoretical standpoint, the integration of policy implementation theory, street-level bureaucracy, and digital inclusion frameworks helps explain how national reforms are filtered through local constraints to produce hybrid, uneven outcomes. By empirically mapping the interaction of governance, infrastructure, and agency, this study extends the literature on digital inclusion beyond metropolitan contexts. It demonstrates how "symbolic compliance" becomes a defining feature of reform trajectories in peripheral urban settings.

The implications are twofold. For policy, the findings suggest that inclusive digital education requires more than technology provision; it demands stable fiscal transfers, localized adaptation mechanisms, and embedded professional support systems. For research, the study underscores the need to move beyond access-based metrics and examine how governance arrangements and actor discretion shape the lived realities of policy implementation.

Limitations must be noted. As a single-case, qualitative study, the findings are context-specific and not statistically generalizable. The absence of longitudinal data limits the ability to capture changes over time, and student perspectives were not systematically included. Future research could adopt comparative, mixed-method, or longitudinal designs across multiple regions to assess the broader applicability of these dynamics and further test the argument that fiscal stability and

governance flexibility are as critical as infrastructure and skills for sustaining inclusive digital education.

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