

## Rethinking information and communication technologies (ICT) for development: A philosophical re-examination

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### ABSTRACT

Information and Communication Technologies for Development (ICT4D) has emerged as a critical field addressing global development challenges through technological interventions. However, the field has been increasingly critiqued for its epistemological assumptions, ontological foundations, and ethical implications rooted in Western-centric paradigms. This paper presents a comprehensive philosophical re-examination of ICT4D, drawing on critical theory, postcolonial perspectives, decolonial approaches, and capability frameworks. Through systematic analysis of recent scholarship (2020-2025), we explore how philosophical inquiry challenges dominant development paradigms, interrogates the digital divide through justice lenses, and reimagines ICT4D's relationship with Sustainable Development Goals. Our review synthesizes insights from 25 scholarly works, revealing tensions between universalist technological determinism and contextually grounded, pluralistic approaches to development. Key findings indicate a paradigm shift toward decolonial epistemologies, epistemic justice, human-centered capabilities, and ethical frameworks that prioritize local knowledge systems. We argue that rethinking ICT4D requires fundamental reconsideration of power relations, knowledge production, and the very concept of "development" itself. This philosophical re-examination offers pathways toward more equitable, sustainable, and contextually relevant ICT4D practices that honor epistemic plurality and challenge neocolonial technological interventions. The analysis demonstrates that advancing equitable and sustainable ICT4D requires the institutionalization of participatory and co-design approaches grounded in local and indigenous knowledge, the adoption of capability- and justice-based evaluative frameworks, and the integration of ethical and decolonial principles into ICT governance, policy, and funding structures.

**Keywords:** Capability Approach, Digital Divide, Epistemic Justice, ICT4D, Philosophy of Technology, Postcolonial and Decolonial Perspectives

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### I. INTRODUCTION

The field of Information and Communication Technologies for Development (ICT4D) has evolved significantly since its inception, moving from techno-optimistic narratives of the 1990s to more critical, nuanced understandings of technology's role in development processes. However, despite decades of implementation and scholarship, fundamental questions about the philosophical foundations of ICT4D remain underexplored. What constitutes "development"? Whose knowledge counts in designing technological interventions? How do power relations shape the deployment and outcomes of ICTs in the Global South? These questions demand philosophical inquiry that goes beyond instrumental evaluations of technological efficacy.

Recent scholarship has increasingly called for critical examination of ICT4D's epistemological assumptions, ontological commitments, and ethical implications [1], [2], [3]. The field has been critiqued for perpetuating Western-centric paradigms that privilege certain forms of knowledge while marginalizing indigenous, local, and alternative epistemologies [4], [5]. This critique extends to the very concept of "development" itself, which has been interrogated through postcolonial and decolonial lenses as potentially reproducing neocolonial power structures [6], [7].

The urgency of this philosophical re-examination is heightened by the global commitment to Sustainable Development Goals (SDGs) and the increasing digitalization of development interventions. As digital technologies become central to achieving SDG targets, questions about digital inequalities, justice, and the principle of "leaving no one behind" demand philosophical frameworks that can address structural inequalities and epistemic injustices [8], [9]. The COVID-19 pandemic further exposed and exacerbated digital divides, making philosophical inquiry into the foundations of ICT4D not merely academic but urgently practical [10]. In response to these concerns, this paper

undertakes a systematic philosophical re-examination of ICT4D by critically engaging contemporary scholarship that interrogates its epistemological, ontological, and ethical foundations. Rather than evaluating specific technologies or development outcomes, the analysis foregrounds the normative assumptions, power relations, and knowledge hierarchies that shape how ICT4D is conceptualized and practiced. The study adopts a qualitative interpretive synthesis of recent literature to examine how critical theory, postcolonial and decolonial perspectives, capability frameworks, and justice-oriented approaches are reshaping contemporary ICT4D discourse.

The analysis begins with a review of theoretical and philosophical perspectives that have shaped contemporary critiques of ICT4D, followed by an outline of the methodological approach underpinning the interpretive synthesis. The discussion then develops the paper's central findings, tracing paradigm shifts and philosophical tensions that influence development practice and policy. The concluding section integrates these insights and advances normative recommendations for more just and contextually responsive ICT4D.

### 1.1 Statement of the Problem

Despite the widespread adoption of Information and Communication Technologies for Development across Global South contexts, ICT4D continues to be guided by largely unexamined epistemological assumptions, ontological commitments, and ethical orientations. Much of the field has historically emphasized technological access, efficiency, and scalability, often treating technology as a neutral instrument for development. This orientation has reinforced techno-deterministic and universalist approaches that insufficiently account for power relations, knowledge hierarchies, and contextual diversity.

Although recent critical, postcolonial, and decolonial scholarship has challenged these foundations, such critiques remain fragmented across disciplines and theoretical traditions. Consequently, ICT4D lacks a coherent philosophical synthesis capable of systematically interrogating how Western-centric development paradigms marginalize local and indigenous knowledge systems, reproduce epistemic injustice, and perpetuate neocolonial power relations.

This gap is especially consequential given the increasing reliance on digital technologies to achieve the Sustainable Development Goals. In the absence of explicit philosophical grounding, ICT4D interventions risk reproducing structural inequalities, exacerbating digital divides, and undermining the principle of leaving no one behind. The central problem, therefore, is not the scarcity of ICT4D initiatives, but the insufficient philosophical scrutiny of the concepts of development, knowledge, justice, and power that shape their design, evaluation, and governance. Addressing this problem requires a structured philosophical re-examination capable of clarifying conceptual tensions and informing more equitable and ethically grounded ICT4D practice.

### 1.2 Research Objective

The primary objective of this study is to undertake a comprehensive philosophical re-examination of Information and Communication Technologies for Development by critically synthesizing contemporary scholarship that interrogates its epistemological, ontological, and ethical foundations.

Specifically, the study seeks to:

1. Examine how recent ICT4D scholarship conceptualizes development, technology, and human well-being through critical, postcolonial, decolonial, and capability-based frameworks.
2. Identify dominant philosophical tensions and paradigm shifts shaping contemporary ICT4D discourse, particularly with respect to power relations, knowledge production, and justice; and
3. Articulate normative insights and directions that can inform more equitable, contextually grounded, and ethically informed ICT4D research, policy, and practice.

Through this objective, the study aims to advance conceptual clarity and philosophical reflexivity within ICT4D, contributing to the reorientation of the field toward approaches that foreground epistemic plurality, human capabilities, and social justice.

## II. LITERATURE REVIEW

### 2.1 Theoretical Review

This study employs a structured philosophical literature synthesis to examine how recent ICT4D scholarship has engaged with questions of knowledge, power, justice, and human development. The review focuses on peer-reviewed literature published between 2020 and 2025 in order to capture contemporary theoretical shifts and emerging philosophical debates within the ICT4D field.

Relevant sources were identified through targeted searches in major academic databases, including Scopus, Web of Science, and Google Scholar, complemented by manual searches of leading journals in information systems, development studies, and science and technology studies. Search terms combined *ICT4D* with conceptually oriented

keywords such as *critical theory*, *postcolonial*, *decolonial*, *capability approach*, *epistemic justice*, *digital inequality*, and *ethics of technology*. Reference chaining was also employed to identify influential works cited within key articles.

Inclusion criteria required that publications (i) engage ICT4D as a central analytical concern, (ii) adopt or explicitly discuss philosophical, critical, or normative frameworks, and (iii) contribute conceptual or theoretical insights relevant to development discourse. Studies were excluded if they focused exclusively on technical performance, adoption metrics, or implementation efficiency without engaging broader epistemological, ontological, or ethical questions. Applying these criteria resulted in a final corpus of 25 sources, selected to reflect both thematic diversity and representation of Global South perspectives.

The analysis followed a qualitative interpretive synthesis approach. Each source was examined iteratively to identify dominant philosophical frameworks, recurring conceptual tensions, and normative positions regarding development and technology. Rather than aggregating empirical findings, the synthesis emphasizes comparative interpretation across theoretical traditions, enabling the identification of paradigm shifts and points of convergence and divergence within contemporary ICT4D scholarship.

### 2.1.1 Critical and Postcolonial Perspectives in ICT4D

The emergence of Critical ICT4D represents a significant paradigm shift in how scholars conceptualize technology's role in development. Akbari et al. [1] argue for a fundamental paradigm change, employing critical theory to interrogate the power relations, ideological assumptions, and structural inequalities embedded in ICT4D interventions. Their work draws on Frankfurt School critical theory and Marxist analysis to reveal how ICT4D can reproduce capitalist relations and neocolonial dependencies rather than challenging them. This critical perspective demands that researchers and practitioners examine not only what technologies do, but whose interests they serve and what power structures they reinforce or challenge.

Roberts [2] extends this critique by bringing Critical ICT4D "from the margin to the centre," arguing that critical perspectives should not be peripheral concerns but central to ICT4D theorization and practice. Drawing on postcolonial theory and critical development studies, Roberts demonstrates how mainstream ICT4D discourse often reproduces colonial logics of "civilizing" the Global South through technology transfer. This postcolonial critique reveals how ICT4D interventions can perpetuate epistemic violence by devaluing local knowledge systems and imposing Western technological solutions as universal remedies.

The concept of "digital development dilemma" articulated by Akbari [3] captures the fundamental tension in ICT4D: technologies designed to promote development may simultaneously create new forms of dependency, inequality, and marginalization. This dilemma is not merely technical but deeply philosophical, requiring examination of the ontological assumptions about what constitutes progress and the epistemological frameworks that determine valid knowledge in development contexts.

Schelenz et al. [11] provide a comprehensive critique of ICT4D that synthesizes multiple philosophical perspectives, including critical theory, postcolonial studies, and science and technology studies (STS). Their analysis reveals how ICT4D has historically been dominated by deterministic assumptions about technology's inherent capacity to drive development, neglecting the social, political, and cultural contexts that shape technological outcomes. This critique calls for more reflexive approaches that acknowledge the contingency, contestation, and complexity of ICT4D interventions.

### 2.1.2 Decolonial Epistemologies and Epistemic Justice

Decolonial perspectives have emerged as particularly powerful frameworks for rethinking ICT4D's epistemological foundations. Sanches et al. [4] introduce the concept of *tecnologia social* (social technology) as a Latin American decolonial approach that emphasizes community centrality and epistemic justice. Through design ethnography of a solidarity cryptocurrency project in a Brazilian favela, they demonstrate how decolonial approaches can foster "epistemic dialogical tension" a process wherein different epistemologies coexist and accommodate each other rather than one dominating the other. This concept challenges the epistemic hegemony of Western technological paradigms and creates space for indigenous and local knowledge systems.

Godefroid et al. [5] apply Ubuntu philosophy an African ethical and philosophical framework emphasizing interconnectedness and communal well-being to decolonize IT governance in international NGOs. Their work demonstrates how indigenous philosophical traditions can provide alternative frameworks for organizing technological interventions that prioritize relational ethics over individualistic efficiency. Ubuntu's emphasis on "I am because we are" offers a fundamentally different ontological foundation for ICT4D than Western liberal individualism.

The decolonization of information systems extends to educational technology as well. Adam [12] develops a justice-oriented framework for decolonizing and desecularizing educational technology, arguing that both colonial epistemologies and secular assumptions have marginalized non-Western and religious knowledge systems. This

framework employs critical race theory, decolonial theory, and Islamic epistemology to challenge the universalist pretensions of educational technology design.

Zhang et al. [6] propose "digital self-determination" as an alternative paradigm for emerging economies, drawing on postcolonial theory and indigenous rights frameworks. This concept emphasizes communities' rights to determine their own technological futures rather than having development pathways imposed by external actors. Digital self-determination challenges the paternalism often implicit in ICT4D interventions and centers agency, autonomy, and sovereignty in technological development.

Naveed et al. [13] employ decolonial feminist lenses to examine gender in Pakistan's digital policies, revealing how colonial legacies and patriarchal structures intersect in shaping digital governance. Their analysis demonstrates that decolonizing ICT4D requires attention to multiple, intersecting forms of oppression and the ways colonial epistemologies continue to shape contemporary digital policies.

### 2.1.3 Capability Approach and Human-Centered Development

The Capability Approach, developed by Amartya Sen and Martha Nussbaum, has become a prominent philosophical framework for rethinking development in ICT4D. Dutta et al. [14] apply the capability approach and social justice frameworks to analyze the gender digital divide in India, arguing that digital access should be understood not merely as possession of devices but as capabilities real freedoms to achieve valued functionings. This philosophical shift moves ICT4D from focusing on technological inputs to examining what people are actually able to do and be with technologies.

Grobbelaar [15] develops a comprehensive framework for human-centered ICT4D initiatives based on the capability approach, applied to mobile health (mHealth) in South Africa. This framework emphasizes that ICT4D should expand human capabilities and freedoms rather than imposing predetermined technological solutions. The capability approach provides normative criteria for evaluating ICT4D: do interventions expand people's real freedoms and opportunities for human flourishing?

The capability approach also intersects with feminist theory in analyzing digital inequalities. Dutta et al. [14] demonstrate how Nussbaum's capabilities framework can illuminate the gendered dimensions of digital exclusion, revealing how patriarchal structures limit women's capabilities to access, use, and benefit from ICTs. This analysis shows that addressing the digital divide requires not just technological provision but transformation of social structures that constrain capabilities.

Carrasco [16] proposes an ethical and human-centered ICT4D framework that synthesizes capability approach with ethics of care and human rights frameworks. This synthesis addresses the "digital paradox" the simultaneous potential of ICTs to promote human development and to create new forms of exploitation and harm. The framework emphasizes dignity, agency, and well-being as central ethical criteria for ICT4D.

### 2.1.4 Digital Divide through Philosophical Lenses

The digital divide has been reconceptualized through various philosophical lenses that move beyond simple access gaps to examine structural inequalities and justice. Rothe et al. [8] employ intersectionality theory to analyze digital inequalities in relation to the SDG principle of "leaving no one behind." Their analysis reveals how digital inequalities are not singular but intersect with gender, race, class, geography, and other axes of marginalization. This intersectional approach demands that ICT4D address multiple, overlapping forms of exclusion rather than treating the digital divide as a uniform phenomenon.

O'Sullivan et al. [9] develop a "Just Digital" framework for ensuring equitable achievement of SDGs, drawing on theories of distributive justice, recognition justice, and procedural justice. This framework argues that digital development must address three dimensions of justice: fair distribution of digital resources and benefits, recognition and respect for diverse communities and knowledge systems, and meaningful participation in decision-making about digital futures. The Just Digital framework provides normative criteria for evaluating whether ICT4D interventions promote or undermine justice.

Dutta et al. [14] analyze the gender digital divide through social justice lenses, revealing how digital exclusion is not merely a technical problem but a manifestation of deeper structural injustices. Their capability approach analysis shows that gender digital divides reflect and reinforce patriarchal power structures that limit women's freedoms and opportunities. Addressing these divides requires not just technological interventions but social transformation.

The philosophical examination of digital divides also extends to questions of epistemic justice. Kim [17] deconstructs "big data for development" (BD4D) through postcolonial and critical data studies lenses, revealing how datafication can reproduce colonial patterns of knowledge extraction and epistemic marginalization. This analysis shows that digital divides are not only about access to technologies but also about whose data counts, who controls data, and whose knowledge is valued in data-driven development.

### 2.1.5 Ethics, Ontology, and Epistemology in ICT4D

Philosophical inquiry into ICT4D increasingly addresses fundamental questions of ethics, ontology, and epistemology. Roberts et al. [18] examine datafication and dehumanization in participatory development, arguing that data-driven approaches can reduce human beings to data points, erasing the complexity, agency, and dignity of people in development contexts. This critique draws on phenomenology and ethics to argue for approaches that preserve human subjectivity and relationality.

Oliveira [19] develops a decolonial critical theory of artificial intelligence, synthesizing Frankfurt School critical theory with Latin American decolonial philosophy. This framework interrogates the ontological assumptions embedded in AI systems and their implications for development. Oliveira argues that AI systems often encode Western ontologies that may be incompatible with non-Western worldviews, creating epistemic and ontological violence.

Osei-Bryson et al. [20] call for advancing contextually relevant ICT4D theories, arguing that the field has been dominated by theories developed in and for Western contexts. They propose moving from explanation-focused theories to design-oriented theories that are grounded in local contexts and epistemologies. This shift requires epistemological humility and recognition that Western theoretical frameworks may not adequately capture the realities of ICT4D in diverse contexts.

Subramanian et al. [21] examine digitalization in the non-West through Science and Technology Studies (STS) lenses, arguing for "peripheral visions" that center non-Western experiences and knowledge systems. Their analysis reveals how mainstream STS and ICT4D scholarship often marginalizes non-Western perspectives, treating them as peripheral cases rather than central sites of knowledge production. This epistemological critique calls for pluralizing the knowledge bases of ICT4D.

Patel [22] rethinks neoliberal ICT governance for indigenous peoples, drawing on indigenous epistemologies and political philosophy. This work argues that neoliberal governance frameworks impose ontologies of individualism and commodification that are fundamentally incompatible with indigenous worldviews emphasizing relationality and collective stewardship. Rethinking ICT governance for indigenous contexts requires honoring indigenous ontologies and epistemologies.

Pérez-García [23] explores the "ICT-Buen Vivir paradox," examining how indigenous communities in Latin America use digital tools to defend cultures rooted in Buen Vivir (good living) philosophy a worldview that challenges Western development paradigms. This paradox reveals tensions between indigenous ontologies that emphasize harmony with nature and community well-being, and the extractive, growth-oriented logics often embedded in digital technologies.

## III. METHODOLOGY

This study adopts a qualitative philosophical review methodology grounded in a structured and transparent synthesis of contemporary ICT4D scholarship. The methodological approach is designed to enable systematic interrogation of the epistemological, ontological, and ethical foundations of ICT4D, rather than empirical measurement of technological outcomes. Accordingly, the study prioritizes conceptual rigor, interpretive depth, and analytical coherence.

### 3.1 Research Design

The study employs a qualitative interpretive synthesis design, suitable for philosophically oriented reviews that aim to examine theoretical positions, normative arguments, and conceptual tensions across bodies of literature. This design facilitates comparative interpretation across diverse philosophical traditions while allowing reflexive engagement with underlying assumptions shaping ICT4D discourse.

### 3.2 Literature Identification and Selection

Relevant literature was identified through targeted searches in major academic databases, including Scopus, Web of Science, and Google Scholar, complemented by manual searches of leading journals in information systems, development studies, science and technology studies, and ICT4D. Search strategies combined ICT4D-related terms with philosophically oriented keywords, including philosophy of technology, critical ICT4D, postcolonial and decolonial ICT, capability approach, epistemic justice, and digital development ethics.

The review focused on peer-reviewed journal articles, edited book chapters, and authoritative conference proceedings published between 2020 and 2025, in order to capture recent theoretical developments and emerging philosophical debates within the field.

### 3.3 Inclusion and Exclusion Criteria

To ensure analytical relevance and conceptual depth, publications were included if they:

1. Engaged ICT4D as a primary or substantial analytical focus;
2. Employed or explicitly discussed philosophical, critical, or normative frameworks; and
3. Contributed conceptual, theoretical, or reflective insights into development, technology, power, knowledge, justice, or human well-being.

Publications were excluded if they focused exclusively on technical performance, adoption metrics, or implementation efficiency without engaging broader epistemological, ontological, or ethical questions. Applying these criteria resulted in a final corpus of 25 scholarly works, selected to reflect both thematic diversity and geographical breadth across Global South contexts.

### 3.4 Analytical Procedure

The selected literature was analyzed using a qualitative interpretive synthesis approach. Texts were examined iteratively to identify recurring philosophical themes, conceptual tensions, normative orientations, and underlying assumptions regarding development and technology. Rather than aggregating findings or extracting empirical indicators, the analysis emphasized comparative interpretation across critical theory, postcolonial and decolonial perspectives, capability frameworks, and ethical philosophy.

This iterative process enabled the identification of paradigm shifts, convergences, and divergences within contemporary ICT4D scholarship, while preserving sensitivity to contextual and regional variations.

### 3.5 Methodological Rigor and Reflexivity

Analytical rigor was ensured through transparent documentation of search strategies, explicit inclusion and exclusion criteria, and systematic cross-comparison of theoretical positions. Reflexivity was maintained by critically examining the philosophical assumptions embedded in both the reviewed literature and the synthesis process itself. While the study does not seek empirical generalization, methodological transparency enhances the credibility, coherence, and reproducibility of the review within philosophically grounded research traditions.

## IV. FINDINGS & DISCUSSION

### 4.1 Paradigm Shifts in ICT4D Theorization

Our analysis reveals a significant paradigm shift in ICT4D scholarship from instrumental, techno-deterministic approaches toward critical, reflexive, and philosophically-grounded frameworks. This shift is characterized by several key movements:

*From Technological Determinism to Social Construction:* Recent scholarship consistently challenges technological determinism the assumption that technologies have inherent, inevitable effects regardless of context [1], [2], [11]. Instead, scholars emphasize the social construction of technology, showing how ICT outcomes are shaped by power relations, cultural contexts, and political-economic structures [4], [5], [17]. This shift requires examining not just what technologies do, but how they are designed, deployed, and appropriated in specific contexts.

*Illustrative Case: Solidarity Cryptocurrency and Decolonial Epistemology in Practice:* A concise illustration of how decolonial epistemology and community agency shape technological outcomes is provided by the Brazilian solidarity cryptocurrency initiative analyzed by Sanches *et al.* [4]. Unlike dominant ICT4D approaches that frame digital financial technologies as scalable, technically neutral solutions to financial inclusion, this initiative foregrounds epistemic authority and participatory design as central determinants of technological effectiveness.

Rather than positioning the community as a passive beneficiary, the design process is organized as a site of epistemic negotiation in which local economic practices, communal values, and lived experiences are treated as legitimate inputs to technological decision-making. This orientation reflects the *tecnologia social* framework advanced by Sanches *et al.* [4], which conceptualizes technology as socially embedded and normatively constituted rather than universally transferable.

A key mechanism shaping outcomes is “epistemic dialogical tension,” through which multiple knowledge systems are accommodated during design and governance without subordinating local epistemologies to external technical rationalities. As a result, success is evaluated not only through efficiency or adoption metrics but also through criteria such as trust, communal accountability, and locally grounded meanings of value. Community agency is further expressed through governance arrangements that reflect locally negotiated norms of control and responsibility, rather than imported institutional templates [4].

This case exemplifies a broader paradigm shift in ICT4D theorization, demonstrating that technological outcomes are relational and socially produced rather than direct consequences of technical deployment. It shows how epistemic plurality and community agency can actively shape both the form and normative orientation of ICT4D

interventions, challenging prevailing emphases on standardization, scalability, and technological transferability as primary indicators of development success [4].

*From Universal Solutions to Contextual Relevance:* The literature reveals growing recognition that ICT4D interventions must be contextually grounded rather than assuming universal applicability of technological solutions [20], [21]. This shift challenges the "one-size-fits-all" approach that has characterized much ICT4D practice, calling instead for theories and interventions that emerge from and respond to local contexts, knowledge systems, and priorities [4], [6].

*From Development-as-Growth to Development-as-Freedom:* Influenced by the capability approach, recent scholarship reconceptualizes development from economic growth to expansion of human capabilities and freedoms [14], [15], [16]. This philosophical shift has profound implications for how ICT4D is conceptualized and evaluated, moving from metrics of technological adoption to assessments of whether interventions expand people's real freedoms and opportunities for human flourishing.

*From Epistemological Hegemony to Epistemic Plurality:* Perhaps the most significant shift is toward recognizing and valuing epistemic plurality the coexistence of multiple, equally valid knowledge systems [4], [5], [12], [21]. This shift challenges the epistemological hegemony of Western scientific knowledge and creates space for indigenous, local, and alternative ways of knowing. Sanches et al.'s [4] concept of "epistemic dialogical tension" captures this shift, proposing frameworks for navigating epistemic plurality rather than imposing epistemological uniformity.

## 4.2 Philosophical Frameworks Reshaping Development Discourse

Multiple philosophical frameworks are reshaping ICT4D discourse, each offering distinct insights and critiques: *Critical Theory:* Drawing on Frankfurt School traditions and Marxist analysis, critical ICT4D examines power relations, ideological assumptions, and structural inequalities [1], [2], [3]. Critical theory reveals how ICT4D can reproduce capitalist relations and neocolonial dependencies, demanding that interventions be evaluated not just for efficiency but for their effects on power structures and social justice.

*Postcolonial and Decolonial Theory:* These frameworks interrogate the colonial legacies and neocolonial dynamics in ICT4D [4], [5], [6], [13], [19], [22]. Postcolonial theory reveals how ICT4D can perpetuate colonial logics of "civilizing" the Global South, while decolonial approaches propose alternative epistemologies and ontologies rooted in non-Western traditions. The emphasis on decolonization extends beyond critique to constructive proposals for *tecnologia social* [4], Ubuntu-based governance [5], and digital self-determination [6].

*Capability Approach:* Sen and Nussbaum's capability approach provides normative frameworks for evaluating ICT4D based on expansion of human capabilities and freedoms [14], [15], [16]. This approach shifts focus from technological inputs to human outcomes, asking whether interventions expand people's real opportunities to achieve valued functionings. The capability approach also provides frameworks for analyzing digital inequalities as capability deprivations rather than mere access gaps.

*Feminist Theory:* Feminist perspectives, including decolonial feminism and intersectionality, reveal how gender intersects with other axes of marginalization in shaping digital inequalities [13], [14]. Feminist theory challenges both patriarchal structures and colonial epistemologies, demanding attention to how power operates through multiple, intersecting dimensions.

*Indigenous Philosophies:* Ubuntu [5], Buen Vivir [23], and other indigenous philosophical traditions offer alternative ontologies and epistemologies for ICT4D. These frameworks emphasize relationality, communal well-being, and harmony with nature, challenging Western individualism and growth-oriented development paradigms.

*Justice Theories:* Various justice frameworks distributive, recognition, procedural, and epistemic justice provide normative criteria for evaluating ICT4D [8], [9], [14]. These frameworks demand that ICT4D address not only distribution of resources but also recognition of diverse communities and meaningful participation in decision-making.

## 4.3 Contextual and Regional Perspectives

The literature reveals important regional and contextual variations in philosophical approaches to ICT4D: *Latin America:* Latin American scholarship emphasizes decolonial epistemologies, *tecnologia social*, and indigenous philosophies like Buen Vivir [4], [19], [23]. The Brazilian favela cryptocurrency case [4] demonstrates how decolonial approaches can foster epistemic plurality and community-centered development. Latin American philosophy of liberation provides frameworks for critiquing digital dependencies and asserting technological sovereignty [19].

*Africa:* African contexts feature prominently in discussions of Ubuntu philosophy [5], capability approach applications [15], and decolonization of IT governance [5]. Ubuntu's emphasis on communal well-being and interconnectedness offers alternative frameworks for organizing technological interventions that challenge Western individualism.

**South Asia:** South Asian scholarship, particularly from India and Pakistan, emphasizes gender digital divides, capability approaches, and decolonial feminist perspectives [13], [14]. The intersection of colonial legacies, patriarchal structures, and digital policies creates specific challenges requiring contextually-grounded philosophical analysis.

**Indigenous Contexts:** Scholarship on indigenous peoples emphasizes indigenous epistemologies, ontologies, and governance frameworks [22], [23]. The tension between indigenous worldviews and neoliberal ICT governance reveals fundamental incompatibilities that require rethinking governance frameworks to honor indigenous sovereignty and knowledge systems.

**Global South Broadly:** Much scholarship emphasizes the need for "peripheral visions" that center Global South experiences and knowledge systems rather than treating them as peripheral cases [21]. This shift requires epistemological decentering of Western perspectives and recognition of the Global South as sites of knowledge production, not merely knowledge application.

#### 4.4 ICT4D and Sustainable Development Goals

The relationship between ICT4D and SDGs is examined through multiple philosophical lenses: *Justice and "Leaving No One Behind"*: Rothe et al. [8] and O'Sullivan et al. [9] analyze the SDG principle of "leaving no one behind" through justice frameworks, revealing tensions between this principle and the reproductive nature of digital inequalities. Their analysis shows that achieving SDGs through digital means requires addressing structural inequalities and ensuring that digitalization does not worsen existing marginalization.

**Intersectionality and Multiple Inequalities:** The literature emphasizes that SDG achievement requires intersectional approaches that address multiple, overlapping forms of inequality [8], [13], [14]. Digital inequalities intersect with gender, race, class, geography, and other axes of marginalization, requiring comprehensive approaches rather than single-axis interventions.

**Capability Expansion:** The capability approach provides frameworks for linking ICT4D to SDGs by focusing on expansion of human capabilities and freedoms [14], [15]. This approach suggests that ICT4D should be evaluated based on whether it expands capabilities relevant to SDG achievement, such as health, education, and political participation.

**Epistemic Justice and SDGs:** Achieving SDGs requires epistemic justice recognition and valuing of diverse knowledge systems [4], [12]. Top-down, expert-driven approaches to SDGs may marginalize local knowledge and community priorities, undermining the very goals they seek to achieve. *Ethical Frameworks:* The literature emphasizes that SDG achievement through ICT4D requires robust ethical frameworks addressing dignity, agency, and well-being [16], [18]. Data-driven approaches to SDGs risk dehumanization and reduction of complex human realities to quantifiable metrics.

#### 4.5 Discussion

While philosophical critiques of ICT4D have significantly advanced conceptual clarity, their practical implications are often under-specified. To address this theory-practice gap, this section translates key philosophical principles identified in the review into concrete strategies for ICT4D design, implementation, and assessment. Rather than offering prescriptive solutions, the framework presented below provides analytically grounded guidance for researchers, practitioners, and policymakers seeking to operationalize justice-oriented, decolonial, and human-centered approaches within real-world ICT4D interventions.

**Table 1**  
*Translating Philosophical Principles into Practical ICT4D Strategies*

| Philosophical Principle      | Core Philosophical Concern                                   | Implications for ICT4D Design  | Implications for Implementation  | Implications for Assessment and Evaluation   |
|------------------------------|--|--|--|--|
| Epistemic Justice            | Whose knowledge counts in defining problems and solutions    | Co-design processes that treat local and indigenous knowledge as constitutive rather than consultative | Establish participatory governance structures that recognize community epistemic authority | Evaluate whether local knowledge shaped decisions and outcomes, not only technical performance |
| Epistemic Dialogical Tension | Managing plurality without epistemic domination              | Design spaces for iterative dialogue between technical experts and community actors                    | Facilitate ongoing negotiation of meanings, priorities, and trade-offs during deployment   | Assess inclusivity and balance of epistemic participation over time                            |
| Capability Expansion         | Enhancing real freedoms and opportunities                    | Align technologies with locally valued functionings rather than predefined development indicators      | Support complementary social, institutional, and educational conditions enabling use       | Measure changes in users' capabilities and agency, not only access or adoption                 |
| Decolonial Epistemology      | Challenging colonial power relations in knowledge production | Avoid universal design templates; ground solutions in local histories and contexts                     | Shift decision-making authority toward communities and local institutions                  | Examine whether interventions reduce dependency and enhance local autonomy                     |
| Recognition Justice          | Respecting identities, values, and cultural meanings         | Design culturally responsive interfaces and practices  | Ensure respectful engagement with diverse social groups                                    | Assess whether interventions affirm dignity and social recognition                             |
| Procedural Justice           | Fair participation in decision-making                        | Embed inclusive decision processes throughout the project lifecycle                                    | Enable community oversight and accountability mechanisms                                   | Evaluate transparency, participation, and accountability processes                             |
| Ethics of Care and Dignity   | Avoiding harm, exploitation, and dehumanization              | Prioritize human well-being over efficiency or scale   | Implement safeguards against surveillance, exclusion, and misuse                           | Assess unintended harms and impacts on dignity and trust                                       |

#### 4.5.1 From Technological Determinism to Epistemic Plurality

The philosophical re-examination of ICT4D reveals a fundamental shift from technological determinism to recognition of epistemic plurality. This shift has profound implications for both theory and practice. Technological determinism the assumption that technologies have inherent, inevitable effects has long dominated ICT4D discourse, manifesting in assumptions that providing ICT access will automatically generate development outcomes. Recent philosophical scholarship decisively challenges this determinism, showing how ICT outcomes are contingent on social, political, cultural, and epistemological contexts [1], [2], [11], [20].

The move toward epistemic plurality represents perhaps the most significant philosophical contribution of recent ICT4D scholarship. Sanches et al.'s [4] concept of "epistemic dialogical tension" provides a framework for navigating multiple knowledge systems without imposing epistemological hegemony. This approach challenges the assumption that Western scientific knowledge should be the sole or primary basis for ICT4D interventions. Instead, it proposes that multiple epistemologies can coexist, accommodate each other, and generate hybrid knowledge forms that are more contextually relevant and socially just.

However, epistemic plurality raises important questions: How do we navigate conflicts between different knowledge systems? What happens when local knowledge contradicts scientific evidence? How do we avoid romanticizing indigenous knowledge or falling into relativism? These questions require ongoing philosophical work to develop frameworks for epistemic dialogue that honor plurality without abandoning critical evaluation.

#### 4.5.2 Power, Knowledge, and Decolonization

A central theme across the literature is the relationship between power and knowledge in ICT4D. Postcolonial and decolonial perspectives reveal how ICT4D has often reproduced colonial power relations through epistemic violence the devaluation and marginalization of non-Western knowledge systems [4], [5], [6], [13], [19], [22]. This epistemic violence is not merely symbolic but has material consequences, shaping which problems are recognized as important, which solutions are considered legitimate, and whose voices are heard in development decision-making.

Decolonization of ICT4D requires more than adding diverse perspectives to existing frameworks; it demands fundamental transformation of the epistemological, ontological, and ethical foundations of the field. Godefroid et al.'s [5] application of Ubuntu philosophy to IT governance demonstrates what such transformation might look like: rather than simply including African voices in Western governance frameworks, Ubuntu provides an entirely different philosophical foundation emphasizing relationality and communal well-being over individualistic efficiency.

The concept of digital self-determination [6] extends decolonization to questions of sovereignty and autonomy, arguing that communities should have the right to determine their own technological futures. This concept challenges the paternalism often implicit in ICT4D, where external actors (donors, NGOs, technology companies) define problems and solutions for communities. Digital self-determination requires shifting power from external actors to communities themselves, including power over knowledge production, technology design, and development priorities.

However, decolonization also faces challenges: How do we decolonize while working within institutions and funding structures that remain colonial? How do we avoid essentializing "the West" and "the non-West" as monolithic categories? How do we address power inequalities within communities, not just between Global North and South? These questions require ongoing critical reflection and cannot be resolved through simple prescriptions.

#### 4.5.3 Ethical Imperatives and Justice Frameworks

The philosophical re-examination of ICT4D foregrounds ethical imperatives that have often been marginalized in technocratic approaches. Multiple justice frameworks distributive, recognition, procedural, and epistemic provide normative criteria for evaluating ICT4D interventions [8], [9], [14].

*Distributive Justice* concerns fair distribution of digital resources, benefits, and burdens. The digital divide literature reveals massive inequalities in access to and benefits from ICTs [8], [14]. However, distributive justice frameworks show that addressing these inequalities requires more than providing access; it requires examining the structural factors that produce and reproduce digital inequalities. *Recognition Justice* demands respect for and valuing of diverse communities, identities, and knowledge systems [9], [12]. ICT4D interventions that fail to recognize and respect local communities and their knowledge systems perpetuate epistemic injustice even if they provide material resources. *Procedural Justice* requires meaningful participation in decision-making about digital futures [9]. Top-down ICT4D interventions that exclude communities from design and governance decisions violate procedural justice, even if they produce beneficial outcomes. *Epistemic Justice* concerns recognition and valuing of diverse knowledge systems and addressing epistemic marginalization [4], [12]. Epistemic injustice occurs when certain groups' knowledge is systematically devalued or when people are prevented from contributing to knowledge production.

The capability approach provides an integrative ethical framework that encompasses these justice dimensions while focusing on expansion of human capabilities and freedoms [14], [15], [16]. This approach shifts ethical evaluation from technological inputs to human outcomes, asking whether interventions expand people's real opportunities for human flourishing. However, ethical frameworks also face challenges in application: How do we balance different justice principles when they conflict? How do we operationalize abstract ethical principles in concrete interventions? How do we ensure that ethical frameworks are not imposed but emerge from dialogue with communities? These questions require ongoing ethical reflection and cannot be resolved through algorithmic application of principles.

#### 4.5.4 Limitations and Tensions in Philosophical ICT4D

While the philosophical re-examination of ICT4D offers valuable insights, it also faces limitations and tensions: *Theory-Practice Gap*: Much philosophical ICT4D scholarship remains highly theoretical, with limited guidance for practitioners. The gap between philosophical critique and practical implementation remains significant. How do practitioners operationalize concepts like "epistemic dialogical tension" or "digital self-determination" in concrete projects with limited resources and tight timelines?

*Romanticization of Local Knowledge*: While critiquing Western epistemological hegemony, some scholarship risks romanticizing local and indigenous knowledge systems, treating them as inherently superior or unproblematic. All knowledge systems have limitations and internal power dynamics that require critical examination. *Essentialism*: Decolonial and postcolonial scholarship sometimes risks essentializing "the West" and "the non-West" as monolithic, homogeneous categories, obscuring internal diversity and transnational connections. Western and non-Western knowledge systems are not hermetically sealed but have long histories of interaction and mutual influence.

*Power Within Communities*: While much scholarship focuses on power relations between Global North and South, less attention is paid to power inequalities within communities based on gender, class, caste, ethnicity, age, and other factors. Decolonizing ICT4D requires addressing these internal power dynamics, not just external ones. *Scalability and Sustainability*: Contextually-grounded, participatory approaches emphasized in philosophical ICT4D may face challenges of scalability and sustainability. How do we balance the need for contextual relevance with the practical constraints of limited resources and the desire for broader impact?

**Measurement and Evaluation:** Philosophical frameworks like the capability approach provide rich normative criteria but face challenges in measurement and evaluation. How do we assess whether interventions expand capabilities or promote epistemic justice in ways that are rigorous yet contextually sensitive? These limitations do not invalidate philosophical ICT4D but highlight areas requiring further development. The field needs more work bridging theory and practice, developing operational frameworks, and addressing internal power dynamics alongside external ones.

## V. CONCLUSION & RECOMMENDATIONS

### 5.1 Conclusion

This paper has presented a comprehensive philosophical re-examination of Information and Communication Technologies for Development through a critical synthesis of contemporary scholarship interrogating the field's epistemological, ontological, and ethical foundations. Its central contribution lies in demonstrating that ICT4D is undergoing a substantive paradigm shift away from technological determinism and universalist development assumptions toward frameworks grounded in epistemic plurality, decolonial critique, capability expansion, and justice-oriented reasoning. By bringing these philosophical traditions into systematic dialogue, the study advances ICT4D not merely as a technical or policy domain, but as a contested normative project shaped by power relations, knowledge hierarchies, and competing visions of development.

Several interrelated insights emerge from this review. First, rethinking ICT4D requires a fundamental reconsideration of epistemological foundations. The growing emphasis on epistemic plurality challenges the assumption that Western scientific knowledge should serve as the exclusive basis for development interventions. Instead, indigenous, local, and experiential knowledge systems must be recognized as legitimate and constitutive sources of insight. This shift necessitates new frameworks for epistemic dialogue that respect plurality while retaining critical evaluation.

Second, the decolonization of ICT4D extends beyond the inclusion of diverse perspectives within existing frameworks. It requires a deeper transformation of the field's ontological and ethical foundations. Philosophical constructs such as *tecnologia social*, Ubuntu, Buen Vivir, and digital self-determination offer alternative foundations that challenge Western individualism, growth-centric development, and neoliberal governance models. These perspectives foreground relationality, communal well-being, harmony with nature, and community sovereignty as central to development practice.

Third, the analysis demonstrates that addressing digital inequalities requires moving beyond access-based conceptions of the digital divide to examine structural injustices. Justice frameworks encompassing distributive, recognition, procedural, and epistemic dimensions provide normative criteria for evaluating whether ICT4D interventions promote or undermine social justice. Within this context, the capability approach offers an integrative lens that shifts evaluative focus from technological provision to the expansion of human capabilities and freedoms.

Fourth, the pursuit of Sustainable Development Goals through ICT4D must account for the reproductive nature of digital inequalities. The principle of "leaving no one behind" demands intersectional approaches that address overlapping forms of marginalization. Digitalization, if uncritically pursued, risks reinforcing existing inequalities rather than alleviating them, underscoring the need for ethically grounded and justice-oriented frameworks.

Finally, the review highlights the centrality of power and knowledge relations in shaping ICT4D outcomes. Postcolonial and decolonial critiques reveal how ICT4D has historically reproduced colonial power structures through epistemic marginalization. Meaningful decolonization requires shifting authority from external actors toward communities, including control over knowledge production, technology design, and development priorities.

Despite these advances, philosophical ICT4D faces persistent challenges, including bridging the theory-practice divide, avoiding romanticization of local knowledge, addressing internal power inequalities within communities, and developing operationally viable frameworks that remain contextually sensitive. Addressing these tensions requires sustained philosophical engagement and dialogue across scholarly, practitioner, and community domains.

### 5.2 Recommendations

Drawing on the philosophical insights synthesized in this study, the following recommendations are proposed to guide future ICT4D research, practice, and policy.

First, ICT4D research and practice should institutionalize participatory and co-design methodologies that recognize local and indigenous knowledge systems as constitutive to both problem formulation and solution development. Such approaches should move beyond consultative participation toward shared epistemic authority throughout the project lifecycle.

Second, evaluation frameworks in ICT4D should shift from adoption-centric and performance-based metrics toward capability- and justice-oriented assessments. Interventions should be evaluated based on their contribution to expanding human freedoms, agency, and well-being, rather than solely on access, efficiency, or scalability.

Third, ethical and decolonial principles should be embedded within ICT governance, policy formulation, and funding structures. This includes developing governance models that prioritize community sovereignty, safeguard dignity, and address risks associated with datafication, surveillance, and algorithmic harm.

Fourth, future research should advance empirical philosophical inquiry by applying critical, decolonial, and capability-based frameworks to the analysis of concrete ICT4D interventions. Such work would strengthen the connection between philosophical critique and practical implementation.

Fifth, intersectional analysis should be more systematically integrated into ICT4D scholarship and practice in order to address how gender, class, geography, ethnicity, and other axes of inequality interact to shape digital exclusion and development outcomes.

Sixth, greater investment is needed in comparative philosophical research that brings Western and non-Western traditions into dialogue. Such engagement can illuminate both convergences and tensions, enriching ICT4D theory while avoiding epistemological dominance or essentialism.

Finally, pedagogy and capacity-building initiatives in ICT4D should place greater emphasis on philosophical reflection, critical reasoning, and epistemic humility. Transforming how ICT4D is taught and practiced is essential for cultivating ethically grounded and socially responsive development practitioners.

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