Research Article

"A Country in Order": Technopolitics, Nation Building, and the Development of ICT in Ethiopia

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Abstract

Focusing on the case of two ambitious government-led ICT projects in Ethiopia, Woredanet and Schoolnet, this article offers a detailed analysis of how political and technical forces interact and negotiate in authoritarian, yet developmentally oriented regimes. The article builds on and extends the concept of "technopolitics," which emerged in the history of technology tradition to account for the ability of competing actors to envision and enact political goals through the support of technical artifacts. The findings suggest that, even in a developing country that heavily relies on international assistance (such as Ethiopia), discrepancies between interpretations of the same artifacts emerging internationally and locally may lead to processes of substantial reshaping. Rather than employing ICTs according to donors' demands of openness and democratization, the Ethiopian government has appropriated them to support its ambitious state- and nation-building process, while marginalizing alternative ICT uses promoted by other components of society, such as the private sector and Ethiopians in the diaspora.

1. Introduction

The influence of politics on the adoption and adaptation of information and communication technologies (ICTs) is gaining greater attention among scholars exploring the relationship between ICTs and development. The argument that technology has politics (Winner, 1980) is being substantiated by empirical case studies that illustrate how both institutional and technological innovations in developing countries involve struggle and contestation, rather than unmediated adoption of what already exists in different contexts. The view of ICTs as consensual objects with an agreed-upon set of characteristics and possible effects that emerged from the struggle against the global digital divide is being challenged by a more nuanced understanding of ICTs as nodes that are surrounded by tensions and can be appropriated or resisted by different actors to pursue potentially competing goals (Warschauer, 2003; Wilson, 2004; Wilson & Wong, 2007).

At the micro level, this "political" conception of ICTs has inspired in-depth analyses of how power and authority are exercised by individuals and groups. Braathen, Attwood, and May (2012) have illustrated, for example, how politics play a role in how telecenters are envisioned and managed, and how existing imbalances affect the processes by which new technologies empower certain users more than others. Dralega, Due, and Skogerbø (2010), by comparing two ICT-driven initiatives in Uganda and Norway, highlighted how different forms of participation are encouraged or constrained, depending on the ways they resonate with existing political agendas. Over the years, numerous studies have argued and provided evidence that ICTs' potentials to serve as gender equalizers are deeply connected to politics and cannot be reduced to issues of access and technical capabilities (Kuriyan & Kitner, 2009; Kwami, Wolf-Monteiro, & Steeves, 2011; Wheeler, 2007).

At a macro level, the study of the relationship between ICTs and politics in developing contexts has followed two main paths. One path has challenged the supposed neutrality of ICTs on the global stage and stressed

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how the fight to reduce the digital divide has favored rich, innovative countries, locking poor ones in new forms of dependency (Wade, 2002). Studies taking on this argument, in stronger or milder versions, have highlighted the hegemonic character of the ICT definitions embraced and advocated by international organizations reiterating a modernization paradigm, presenting the West as the most successful development model for the rest of the world and promoting liberalization and deregulation as the roads to development (Leye, 2007; Padovani & Nordenstreng, 2005; Raboy, 2004; Thompson, 2004). A second research path, examining the mutual influence between ICTs and politics in authoritarian contexts, has addressed the potential of ICTs to act as "liberation technologies," opening up societies (Diamond, 2010; Howard, 2010), or vice versa, the ability of authoritarian regimes to capture ICTs and restrict their use (Deibert, Palfrey, Rohozinski, & Zittrain, 2008; Kalathil & Boas, 2003; Morozov, 2011).

These research agendas have been instrumental in adding complexity and nuance to the study of ICTs and development, but they have also fallen prey to powerful normative traps. Studies focusing on global power imbalances have largely targeted big corporations and international organizations for their tendency to disguise commercial interests and hegemonic ambitions under the supposed mission of helping the poor enter the information society. By doing so, however, they have often idealized the roles of other actors operating in developing countries, from national governments to civil society organizations, and overlooked how these actors, too, seek to appropriate ICTs in ways that can further their own hegemonic ambitions, rather than embracing them as tools that can help citizens reach their goals. From a different angle, research investigating the potential of ICTs to act as agents of democratization in developing countries has often employed a liberal conception of democracy as its overarching reference point, paying little attention to how "democratic" change may occur through processes and institutions that differ from those characterizing Western democracies yet express more rooted and localized conceptions of governmentality (Bayart, 2009).

This article seeks to address this gap by identifying and employing new analytical tools that enable greater consideration of local politics and local knowledge in the adoption and adaptation of ICTs in developing countries. The approach employed here focuses on the ideas and ideologies that characterize a national political debate and may or may not resonate beyond a country's borders or allow researchers to make such dichotomous comparisons as casting things as either authoritarian or democratic, but instead, arouse people's passions and influence how ICTs are locally (re)shaped. Borrowing the concept of *technopolitics* from the history of technology tradition and looking at how the Ethiopian government has implemented two of the most striking government-led projects in Africa making use of ICTs, Woredanet and Schoolnet, I offer a concrete example of the relevance of political ideologies in accounting for technology adoption and adaptation.

In the next two sections, I present the methods and theoretical frameworks that have guided data collection and analysis. Sections 4–7 then examine the negotiations between technology and politics that led to the emergence of Woredanet and Schoolnet, and sections 8–9 highlight the modes and significance of studying the technopolitics of ICTs in developing contexts.

2. Cases and Methods

Woredanet stands for "network of district (*woreda*) administrations."[1] Woredanet employs Internet Protocol (IP)-based satellite communication to provide a variety of services to the local administrations, such as Internet connection, email service, and Voice over IP (VoIP) service. However, the most common use for Woredanet has been videoconferencing. Using 42-inch plasma TV screens (as shown in Figure 1), ministers, high-level civil servants, and trainers regularly communicate and instruct distant local officials on what they should be doing and how.

Schoolnet uses a similar architecture to broadcast pre-recorded classes on a variety of subjects, from mathematics to civics, to all of Ethiopia's secondary schools, and also to offer political education to school teachers and other government officials (Figure 2). Together, the two systems initially required the deployment of more than 17,000 plasma TV screens and equipment to receive (and in the case of Woredanet, initiate)

1. A woreda *is a unit of approximately 100,000 people, governed by an administration elected every five years.*

Figure 1. The Woredanet equipment, composed of, from top to bottom, a videocamera, a plasma TV screen, a decoder, and an amplifier/equalizer.

transmissions. They represented an enormous undertaking for a government with limited financial and technical resources. In Ethiopia's most remote areas, which lacked electricity and were not served by the main roads, petrol generators were installed and the military was employed to airlift the equipment.

Data collection and preliminary analysis of Woredanet and Schoolnet were carried out during fieldwork that took place in Ethiopia in 2006, 2008, 2012, and 2013 for a total of 15 months. Ninety-two interviews were carried out with the politicians and technocrats who envisioned and realized Woredanet and Schoolnet, as well as with journalists, opposition leaders, members of national and international NGOs, and members of international organizations who practiced and advocated uses of the new media which tried to oppose, patch, or complement those uses advanced by the Ethiopian government. Field visits were made to Woredanet and Schoolnet sites in the regions of Tigray, Amhara, Oromiya, and the Southern Nations Nationalities and Peoples (SNNP) to understand how the two systems operated and how their users perceived them. This evidence was complemented by the collection of archival material in the form of policies and project documents. The analysis proceeded by iteratively comparing conceptualizations emerging from interviews with individuals who shaped the path of ICTs in the country against observations of how the technical artifacts were actually implemented. The span of the research, which took place over six years, allowed for testing some of the interpretations emerging from initial fieldwork with key informants, leading in some cases to revisions of initial hypotheses and introductions of new ones.[2]

2. The ongoing data analysis and triangulation were supported by the use of NVIVO, a software package for the analysis of qualitative data.

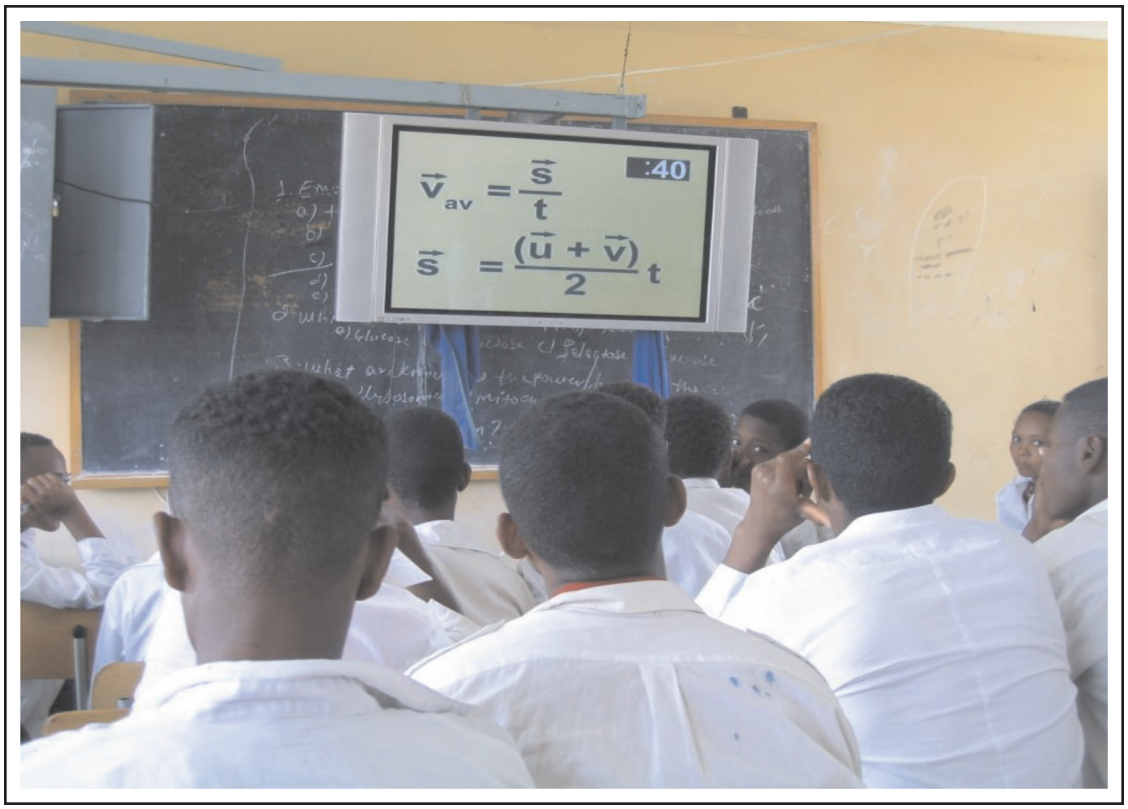

Figure 2. The Schoolnet equipment. The decoder in this case is in a separate room and can only receive signals.

3. Technopolitics

The notion of *technopolitics* elaborated here builds on studies of technologies of national relevance and scale, such as electric grids and nuclear plants, and takes the dialectical understanding of the relationship between technology and organizations developed by information system theorists (Orlikowski, 1992; Suchman, 1994) to the level of the interactions among technology, governments, and other political actors attempting to influence technology adoption and adaptation nationally and internationally. Technopolitics helps in understanding the relationship between information technologies and international development in four main ways.

First, technopolitics shifts attention from individual inventions to the system of relations in which technology is immersed, emphasizing the possibility of both variations on the "same" technology in different cultural and political environments and the emergence of different technological *styles* (Hughes, 1983). Thomas Hughes' seminal work on electrification first illustrated how power plant distribution patterns in London and Berlin at the end of the 19th century differed less for technical reasons than for variances in the political and regulatory regimes that characterized a conservative Britain, where particularistic interests prevailed over the ability of any central power to regulate the market, and a socially democratic Germany, where the state took a greater role as a champion of electrification (ibid.). By analogy, the concept of technopolitics can be employed to examine the different degrees of control exercised over online communication by state actors, or the greater or lesser use of free software by public administrations, as elements defining unique styles in ICT application in different countries.

Second, the concept of technopolitics allows one to take into greater account the ways that political ideologies can influence technological shaping and reshaping. This challenges the supposed neutrality of technical artifacts, opening to the possibility that a particular technology can become part of a national discourse, and

its elements can be captured by the "thickness" of a specific political culture. As Gabrielle Hecht explains in her study of nuclear power in France:

> I use the term [technopolitics] to refer to the strategic practice of designing or using technology to constitute, embody, or enact political goals. Here I define technology broadly to include artifacts as well as nonphysical, systematic means of making or doing things. . . . These technologies are not, in and of themselves, technopolitics. Rather, the practice of using them in political processes and/or toward political aims constitutes technopolitics. Why not just call that practice "politics"? The answer lies in the material reality of the technologies. These technologies cannot be reduced to politics. The effectiveness of technologies as objects designed to accomplish real material purposes matters—among many other reasons—because the material effectiveness of technologies can affect their political effectiveness. (Hecht, 2001, pp. 256–257)

This conception accounts for how policy makers often perceive technology as an extension of their plans and ambitions, rather than as a neutral tool that responds to functional imperatives. When incorporated into the debates on ICTs and development, the concept of technopolitics also allows for a broadening of analysis to include a wider spectrum of political ideologies and behaviors. When ICT for development (ICT4D) studies have taken politics into consideration, they have tended to privilege categories and dichotomies of global relevance, such as authoritarianism vs. democracy, corruption vs. transparency, or opacity vs. openness, yet they have been little able to capture the ways that local politics and ideologies (e.g., a government's conception of citizenship or the nation) may influence technology adoption and adaptation. As the analysis of technopolitics forces researchers to "plunge" into the technical artifact (Callon, 2009), it also diverts researchers from the excesses of social constructivism, which leads to explaining technology simply by analyzing a society and its politics. Studying technopolitics means taking into consideration not only how technology may become an instrument of politics, but also how political ambitions both interact with technological opportunities and constraints and evolve as a result of this interaction.

Third, by stressing the negotiations and tensions through which a particular technology takes shape, the concept of technopolitics also allows one to take power into greater account, a dimension that is often downplayed in studies of ICTs and development. Allen and Hecht explained the links between power and technology while advancing their interpretation of the title of Hughes' work on electrification. They underlined the following:

> [T]he double meaning of networks of power: electricity drives machines, light bulbs, and tramways, but at the same time its constant flux in networks reflects and makes tangible the political life of nation-states. Thus electrical networks are "charged" with corruption in Chicago, with localism in London, and with centralized social democracy in Berlin. (Allen & Hecht, 2001, p. 2)

Technical artifacts do not simply adapt to the networks of power in which they become immersed. They also act as vehicles for exercising power. As Allen and Hecht continue:

> Social choices shape technological development. But the resulting physical, financial, and institutional durability of systems means that, once developed, they—and the values they uphold—cannot be changed easily. As material manifestations of human choices, systems acquire momentum. In so doing they embody, reinforce, and enact social and political power. Thus, human power rides upon the history of things. (Allen & Hecht, 2001, pp. 2–3)

Power and politics must be understood as forces flowing both through the social and the technical, establishing and performing authority, both by making specific meanings more widely accepted than others, and by ensuring that certain assemblages would prevail over alternative ones.

Finally, application of the technopolitics concept to the study of ICTs and development places a greater emphasis on governments' roles in shaping technology. Studies in information systems have challenged the liberal pluralist notion that a government is merely one "actant" among many. These studies have advanced the idea that governments have the interest and ability to use policies and technologies to challenge other dominant groups (Brown, 2001; Wynne, 1996). This emphasis is particularly important in developing countries where the state, while it is not always able to perform its stated functions in terms of the delivery of public

services and goods, still does tend to occupy a position of prominence among other actors involved in policy making and implementation in the ICT sector.[3]

Considering these dimensions in the process of technological adoption and adaptation means not only focusing on what technology does and the effects it produces or may produce in a specific context, but also investigating how technology is perceived and how different actors succeed or fail in turning their conceptualizations into concrete assemblages. This requires mapping those discursive and material elements that are intervening in the process of technological adoption, linking them, and understanding how a specific distribution of power, both as exercised through artifacts and as held by social actors, makes certain applications possible while marginalizing alternative uses.

In the Ethiopian case, analysis of the discursive and material elements that led to the emergence of Woredanet and Schoolnet has shown how ICTs had become part of a struggle among actors battling to assert or resist particular ideas of the Ethiopian nation-state. As explained in the following section, the Ethiopian government progressively emerged as the only entity with enough power and resources to take control of the development of the new technologies nationally, appropriating ICTs to support its ambitious nation-building project, while real or imagined enemies were prevented from developing uses that could challenge it.

4. Ethiopian Politics: Ethnic Federalism and Revolutionary Democracy

Since coming to power in 1991, Ethiopia's ruling party, the Ethiopian People's Revolutionary Democratic Front (EPRDF) has struggled to unite citizens around its idea of the nation. For decades, the precursor to the EPRDF, the guerrilla movement known as Tigrayan People's Liberation Front (TPLF), fought the USSR-backed dictatorship of the Derg for the rights of ethnic groups within the larger Ethiopian state. Once the Derg was defeated, the new agenda focused on rebuilding the state around the two core ideas that had inspired their struggle: *ethnic federalism* and *revolutionary democracy.*[4]

The concept of ethnic federalism reframed Ethiopia from a unitary nation into a federation of ethnicities, all entitled to the same rights to self-determination that mobilized the people of Tigray. By connecting the Tigrayan minority to other oppressed groups and offering them, at least in principle, the opportunity to participate in refounding the nation, the EPRDF presented its capture of the state as a victory for all marginalized groups. Ethnicity emerged as both a means and an end. It served as an operational principle for the redistribution of resources to those recognized as separate ethnic groups. But the provision of material benefits along ethnic lines was also aimed at convincing people on the ground that it was in their interests to be recognized as ethnically diverse (Abbink, 2006; James, Kurimoto, Donham, & Triulzi, 2002; Pausewang, Tronvoll, & Aalen, 2002; Turton, 2006). By building the state—through the creation of new institutions and new rules for citizens to relate them to central and local authority and claim their rights—the EPRDF also aimed at building the nation. It offered new categories and ideational referents for the Ethiopian people to think of themselves as citizens.

The concept of revolutionary democracy similarly emerged at the time of the struggle in the bush, but its definition continued to evolve after the EPRDF came to power. Revolutionary democracy averts the focus on the individual that characterizes liberal democracy, preferring to stress group rights and consensus. It favors a populist discourse, claiming a direct connection of the leadership to the masses, bypassing the need to negotiate with other elites who advance competing ideas of the nation-state (Hagmann & Abbink, 2011; Vaughan & Tronvoll, 2003).

In theory, these principles represented a bold response to providing recognition and equality to disparate parts of a diverse country. In practice, they proved difficult to implement, and increasingly, the EPRDF has focused on developing a strong center that coordinates and controls the peripheries. Measures have been

3. For discussions on the African state, see, e.g., Bayart, 2009; Chabal, 1994; Clapham, 1996; Young, 2012.

4. Ethnic federalism *and* revolutionary democracy *have inspired significant scholarship on contemporary Ethiopia. For the most recent discussion of the relevance of these two ideas in shaping Ethiopian politics, see the 2011 special issue of the* Journal of Eastern African Studies, 5*(4) edited by Hagmann and Abbink entitled "Twenty Years of Revolutionary Democratic Ethiopia, 1991 to 2011."*

adopted to reach the goal, from reforming the civil service to promoting symbolic events such as flag days and other celebrations of the "Unity in Diversity" motto. ICTs have been bent to fit into this scheme, with Woredanet and Schoolnet being among the most striking examples of this process.

The path that led to the creation of systems like Woredanet and Schoolnet was not, however, linear or smooth. It was characterized by a chaotic evolution, marked by an initially slow progression, then a rapid acceleration. Between 1991, when the EPRDF took power, and the early 2000s, the discourse on ICT4D as articulated by international organizations and corporations fluctuated throughout different sectors of Ethiopian society, without finding a concrete application. It was only at the turn of the millennium that a possible fit between international and local discourses started to come into view. Given the nature of the ICT agenda, this fit had to be found at both the discursive and technological levels, and it required the Ethiopian government to develop an understanding of the means that could be mobilized to support its agenda. From 1999–2001, the international community organized an unprecedented number of events on "ICTs for development" in Addis Ababa that forced some key figures, including Prime Minister Meles Zenawi, to engage more seriously with the new tools and rhetoric. The ideas put forward in these fora were often challenged, but the increased attention on ICTs offered Ethiopian leaders an opportunity to reflect on which aspects were more compatible with their political and developmental plans. Despite often being framed as a holistic package, ICTs were not a monolithic entity after all. "Unpacking" ICTs was further facilitated by international companies that, if generally interested in advocating policies built on the open nature of ICTs, also had strong commercial interests, and they were eager to win large contracts in African countries, even if this meant cooperating with a government whose agenda did not align with the ideals these companies publicly espoused.

Once a path was opened to envision systems such as Woredanet and Schoolnet as assemblages taking shape at the crossroads between the opportunities opened by ICTs and the political ambitions articulated at the local level, their implementation proceeded with remarkable speed. In 2004, only a couple years after a Request for Proposal (RFP) was issued by the Ethiopian government, the first Schoolnet classes reached secondary schools and videoconferences took place between the central government and some *woreda* offices. This does not mean that the intervening process led to the creation of fully functioning and efficient systems. As explained in the ensuing sections, Ethiopian leaders had to confront the reality of adapting a technology designed to serve different purposes in order to support their own agenda.

5. Ethiopian Technopolitics: Woredanet, Schoolnet, and Their Role in Consolidating Power

A growing understanding of how ICTs could be employed to serve the Ethiopian government's nation-building plans and the international availability of the skills required to translate this vision into practice provided the government with the opportunity to turn politics into technopolitics. This enhanced dimension of political power offered an opportunity to enact policies through the support of technological artifacts, but it also engaged politicians and engineers in complex negotiations to reconcile political aspirations and technical possibilities.

Before analyzing how the various aspects of the EPRDF's ideology and strategy were embedded into Woredanet and Schoolnet, I outline some of the technical aspects of the two systems. Figure 3 illustrates the architecture on which Woredanet is based. Schoolnet is a simplified version. The system comprises three components: the satellite, represented at the top of the figure; the national data center in the middle left; and the remote sites in the lower right. Each component is described below.

The satellite. The connectivity for Woredanet and Schoolnet was provided by Hughes Network Systems through a transponder with a capacity of approximately 60 Mbps, which had to be shared among all the services offered by the two systems. Schoolnet was allocated approximately 16 Mbps, which were used to broadcast pre-recorded classes. The remaining bandwidth was used by Woredanet to provide various services: videoconferencing, emailing, VoIP, and Internet access. The system also offered broadband on demand, and each service was allocated a certain amount of bandwidth, but each channel could be switched off to free up bandwidth for the others.

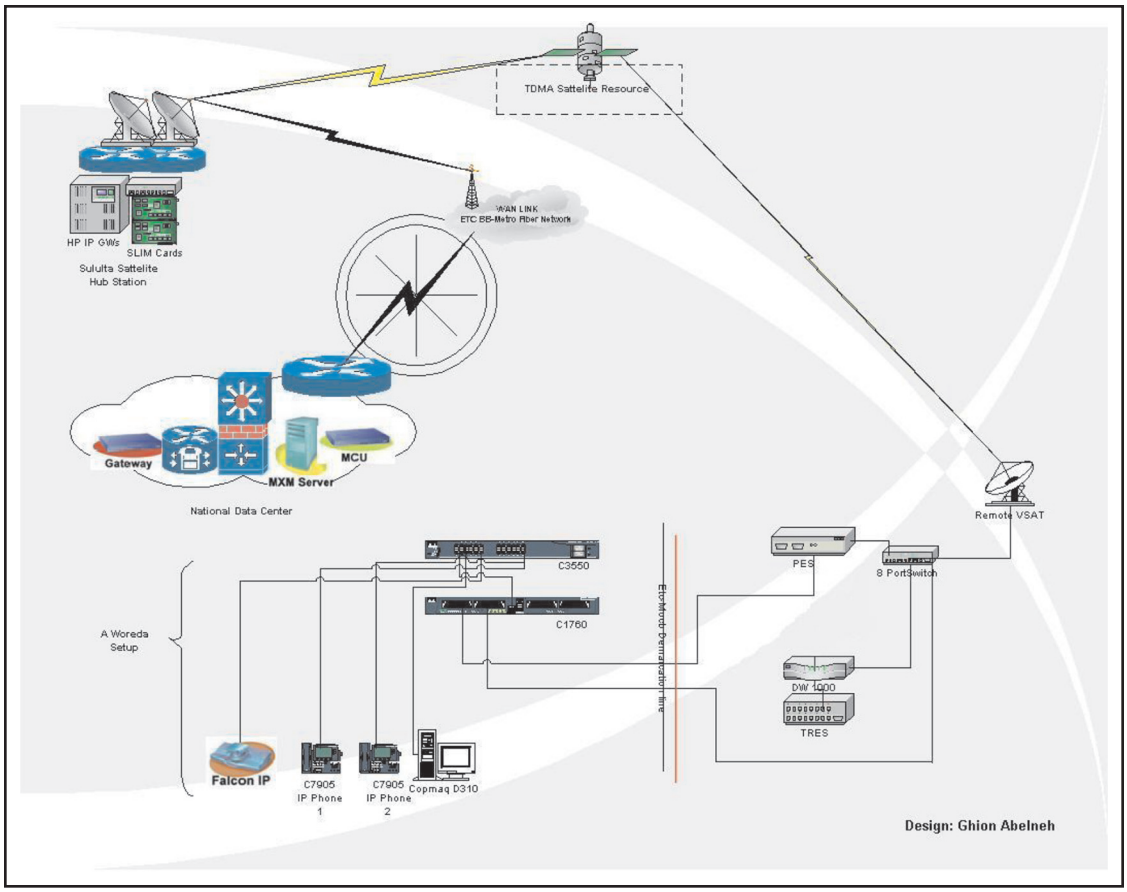

Figure 3. Woredanet architecture (Source: Ethiopia ICT Development Authority).

The national data center. Woredanet's main servers were installed in the national data center, strategically located in the office of the Prime Minister. This site hosted the equipment necessary to manage videoconferencing sessions, as well as to remotely control the other services provided through the satellite.

The remote sites. In Woredanet's architecture, remote sites were equipped with a very small aperture terminal (VSAT); a 2.4-m satellite dish connected to a router and switch, which addressed traffic to three types of equipment: a set of PCs, two VoIP phones; and a videoconferencing system. As shown in Figure 1, the front end of the videoconferencing system included a large plasma TV screen, a videocamera, and other equipment to manage video and audio streams. The videoconferencing system was usually installed in the Bureau of Capacity buildings in the regional and *woreda* offices, so it became necessary for administrators and civil servants to gather there to attend the videoconferencing sessions.

Schoolnet's remote sites are simpler than Woredanet's. As schools only receive broadcast lessons, they do not need videoconferencing equipment or VoIP phones. However, like the Woredanet sites, they receive data streams through a VSAT and have a 42-inch plasma television screen for delivery of the data.

As described so far, the systems may simply appear to be characterized by an eclectic and complicated architecture. However, by closely analyzing some central features of both Woredanet and Schoolnet and how they evolved, it is possible to understand how they have incorporated core ideas of the EPRDF's national project, and in particular, those related to ethnic federalism and revolutionary democracy.

6. Using Technology to Tie the Federal Structure to the Central Political Apparatus

The EPRDF's ethnic federalist project profoundly influenced the development of both Woredanet and Schoolnet. Debretsion Gebre Michael, a trained engineer who was in charge of the setup and maintenance of the clandestine radio the TPLF used during the struggle with the Derg, and who was later instrumental in creating Woredanet and Schoolnet, and then became the first Minister of Communication and Information Technology in 2010, explained this point:

> Ethnic federalism is a key component. In Woredanet you can see the federal system reproduced at the technical level. You have the federal, the regional and the *woreda.* The system is organized in a way that you can make sure the message is delivered to the lowest levels of the government.[5]

The promotion of a discourse reframing the domination of a single minority in the larger context of the right to self-determination of every minority proved a challenging enterprise, often forcing politicians and bureaucrats to devise original solutions to a variety of problems, from the daily administration of the periphery to the consolidation of power at the center. In the case of Schoolnet and Woredanet, this aspect was expressed both in the scale of the two systems and in their convoluted design. Some services, such as videoconferencing from the center to the periphery, were privileged over others, such as access to the Internet or the capacity to communicate horizontally among diverse nodes of the state apparatus.

The scale of Woredanet and Schoolnet was one of the most contentious issues dividing the Ethiopian government and the international community. Donor agencies demanded to pilot the systems first, before full-scale implementation, starting with major towns. The government, however, was responding to a different rationale. Enforcing the principles of ethnic federalism on the ground required allocation of the same rights and resources to every ethnic group. The symbolic value of equally distributing resources among all regions was seen to be as important as its material value. It was essential that each node of the federal state have equal access to the system, even if this might constrain its effective functioning.

Respecting this principle imposed serious technical hurdles, especially for Woredanet. One of the most serious constraints was imposed by the limited bandwidth available through the Hughes-managed satellite. Connecting every *woreda* from the outset meant catering to almost 600 centers. With only 45 Mbps allocated on the transponder to the whole Woredanet system, for every center to be constantly connected, the bandwidth available for each individual center would have to be reduced to an untenable speed.[6]

Paradoxically, these two problems could have cancelled each other out, at least temporarily. While almost all centers were provided with the necessary equipment to run Woredanet, the lack of skills to operate the system and address the technical problems that initially emerged reduced the operational centers to only a fraction of the total number, increasing the bandwidth available for each *woreda* to a level that would, indeed, allow individuals in the remote sites to browse the Internet and use email. However, it was not Internet access that was considered a priority by the central government. It was videoconferencing. And to allow videoconferencing sessions of a quality good enough for the large screens located in each remote site, the bandwidth allocated by Hughes to each Woredanet node was increased to 1 Mbps for download and 512 Kbps for upload. This dramatically reduced the number of nodes that could participate in a videoconferencing session and led to a competition for resources among such services as Internet browsing, videoconferencing, VoIP, and emailing. As individuals who managed and used Woredanet described, this problem was solved simply by switching off the channels allocated to all other services, so as to free up bandwidth for central and remote sites to be "on screen." This produced significant frustration for people using Woredanet at the remote sites. Apart from those times when they were instructed to participate in a videoconferencing session, they did not

5. Interview with Debretsion Gebre Michael, Minister of Communication and Information Technology, Addis Ababa, Ethiopia, June 10, 2008.

6. If each node had to be connected to the Internet, the connection speed would have to be around 7.5 Kbps, half the speed allowed by the first commercial dial-up modems sold on the market in the early 1990s, whose speed was 14.4 Kbps.

know when they could access the Internet. There was no service agreement of any kind. As an officer in charge of IT in a remote *woreda* explained: "No one in the *woreda* knows when the system is going to work and for how long. From the center, people can shut down the system without saying anything in advance, [even] just to test applications."[7]

Additional evidence of the minimal interest in providing the periphery with a reliable Internet connection was provided by the analysis of another aspect of the Woredanet architecture: the convoluted route that packets had to follow to and from the satellites to connect to a remote computer and a server hosting a website. The following explanation by an international consultant details the problem:

> Content from the Internet would have to travel first over satellite/fiber optic gateway from Europe, America, Asia to the ETC gateway and then travel back up to a satellite (perhaps different from the first) to then be retransmitted down to the destination at a distant *woreda* and the user would get their desired Internet content with an extreme amount of delay. Typical roundtrip times for a single satellite hop are over 550 ms with no traffic, so a double-hop path would make interactive applications very difficult to use and websites very hard to navigate. (Haque, 2004, p. 13)

If the Internet was a priority, this complex system could have been simplified with a few changes in the architecture by reducing the two hops to one and making the transport of Internet data faster and cheaper. Videoconferencing packets, on the other hand, were unaffected by this issue, as they only had to travel "locally," with no need to access data coming from outside Ethiopia. Therefore, the alternative architecture that could have facilitated Internet browsing without affecting the other services was not implemented.[8]

Keeping in mind the concept of ethnic federalism described earlier, it is possible to see how these decisions to favor more centrally directed services, such as videoconferencing, over more decentralized ones, such as accessing the Internet, were rooted in the attempt to reconcile some of the contradictions the EPRDF became embroiled in as a result of its political project. As the historian Bahru Zewde pointed out, while implementing its ethnic federalist project, the EPRDF had to concurrently contain the centrifugal forces this project could unleash that had the potential to threaten the leaders' ability to maintain the control they sought. As Zewde pointed out:

> This is the paradox the current government created: it is a minority government and it needs to justify with an ideology like ethnic federalism its staying in power. They need to decentralize to support their ideology but also to exert a central control to make sure they can stay in power.[9]

Woredanet was installed in the remote areas not to empower individuals to find solutions to their problems independently (i.e., through accessing the Internet), but to enable the central authorities to impart clear directions when needed. As a former member of the EPRDF suggested:

> The people at the centre do not allow people at the *woreda* level to make their own mistakes. There is this obsession with control and command. So the people in the *woredas,* even if more trained and skilled . . . they are not allowed to learn from trial and error. They will always wait for instructions and will be afraid of taking responsibility.[10]

The technical and the political were aligned to make sure that the decentralization process necessary to implement an ethnic federation could be controlled by the center, so as to prevent the nodes of the federal government from gaining too much independence.

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7. Interview with a technology officer at a private IT firm, Addis Ababa, Ethiopia, April 24, 2008.

8. Rather than being channelled through the ETC gateway, the Internet data could have been provided directly from a teleport on either the Hughes' satellite or another one. This would have entailed equipping the remote sites with receiving infrastructure and a routing system that would allow concurrent reception and signal forwarding from both sources (one signal from the international teleport and the other from the "local" ETC gateway).

9. Interview with historian Bahru Zewde.

10. Interview with Yemane Kidane, a former member of EPRDF and an officer in the Ministry of Foreign Affairs, Addis Ababa, Ethiopia, June 5, 2008.

The central government, however, was not completely free to dictate the conditions to the peripheral nodes of the state apparatus, as it had to work within the institutional framework it had created. This had consequences for the design and redesign of Woredanet and Schoolnet. As an ICT expert who had been deeply involved in the development of both systems, as well as in other ICT projects in the country, explained:

> The regions were quite assertive when they wanted to get resources, they wanted to use the rights they have been entitled of by the constitution. In the case of Woredanet, they made sure that a videoconference could be started also at the regional level, so that they could also make use of the system for their own purposes.[11]

Among the types of videoconferencing that Woredanet allowed, the solution that was privileged in the end allowed both the central and the regional governments—but not the *woredas*—to initiate a videoconference and communicate with the other nodes connected by the system. This is indicative of how the technical and the political had to be constantly renegotiated. Even if, with Woredanet, the central government aimed at retaining power within the ethnic federation, it still had to make concessions, some of which had repercussions for the design of the systems, when requests were framed within the context of the constitutional framework it had created to rebuild the nation and the state.

7. Revolutionary Democracy and ICTs

Since the beginning of the guerrilla struggle against the Derg regime, the commitment to the peasantry played a central role in legitimizing EPRDF's political project, but it also served as a populist means to affirm its control over Ethiopian citizens. Woredanet and Schoolnet represented a modern and technologically enhanced emanation of this longstanding strategy. On one hand, the two systems improved service delivery and the quality of life in rural communities. On the other hand, they also increased the presence of the state on the ground, opening new communication channels directly with the grassroots. The strategy had both practical and symbolic components. As Bereket Simon, who held several government posts, including Minister of Communication, explained:

> Woredanet is for different purposes. It is to strengthen the capacity of the public administration, but it is also to reach rural Ethiopia, to make sure that the farmers get the right information. Woredanet is part of the wider communication strategy we have developed. Instead of communicating with everybody, we prefer to communicate with the most advanced part of the society and let it be our messenger.[12]

At the practical level, Woredanet had to build the capacity of the state's peripheral nodes by training and instructing individuals, many with little formal education, to enable them to provide better services. This had to benefit the whole community, but at the same time, it had to symbolize the government's commitment to the rural population. The "most advanced part of the society" was required to both demonstrate the principles inspiring the Ethiopian state through their actions and become the leaders and disseminators of a wider strategy. It was therefore quite important that everybody knew what this strategy was. As an ICT officer in a rural *woreda* described the main functions of Woredanet in his locality, the government was successful in this respect. As he explained:

> This time it is possible that even the people at the grassroots level can receive the same information, they can receive the very voice of the Prime Minister. We have been using the system mostly for videoconferencing. It helps a lot to understand what the line of the government is, but also to learn new practices.[13]

At the lower levels of the state apparatus, there was an awareness and acceptance that administrators and civil servants had to serve as performers of policies that had been decided at the center. Through Woredanet, the

11. Interview with ICT expert, Addis Ababa, Ethiopia, May 10, 2013.
12. Interview with Bereket Simon, minister of communication, Addis Ababa, Ethiopia, June 24, 2008.
13. Interview with a civil servant, Awasa, Ethiopia, April 27, 2008.

EPRDF leaders at the central level could thus reach the grassroots in a mediated way, by turning members of the state apparatus in the peripheries into messengers of ideas and policies formulated at the center.

As a complement to Woredanet, Schoolnet was designed to reach targets in the peripheries more directly. Schoolnet's primary objective was to enable students living in the countryside to have access to the same quality of education as those in the major towns and cities. When the system became functional in remote areas, those students no longer had to rely on poorly trained teachers for their education, as was often the case. This was a powerful symbol of the EPRDF's commitment to guaranteeing every citizen equal opportunities. Abiding by this principle was deeply symbolic but often impractical. All the classes are taught in English, as required by the Ministry of Education, which has caused serious comprehension problems for many students (Asefa, 2006).

Students receiving Schoolnet broadcasts could also be trained in the founding principles of the state. Civic and ethical education was one of the first subjects included in the Schoolnet programming, and according to some critics, the way it was taught was highly problematic. Some of the modules for the higher grades addressed ways to curb corruption, respect human rights, and participate in elections. Other issues addressed by the civic education classes were seen as more politicized. For example, opponents of the idea of ethnic federalism would strongly challenge a statement like the following, reported both in the textbook of civic education and in the broadcast classes: "The right to equality of Nations, Nationalities and Peoples includes the equal rights to full measure of self-governance. . . . It also creates better conditions for national unity" (Engida, 2007, p. 91).

Many EPRDF cadres held a strong faith in the power of the new teachings to influence young Ethiopians. As Bereket Simon noted, referring to Schoolnet:

> In our education our cornerstones are math, science and civic and ethical education. So we can have a home-grown democracy. A country in order. Now we will have a new generation that has been trained in the principles of democracy in secondary education and they will know how to contribute to the development of the country.[14]

These words acquire even more significance when located within the broader context of the role young, educated Ethiopians played in the country's political transformations. Many of the TPLF's early recruits during the struggle against the Derg were secondary school students.[15] Appreciation of youth's role in political mobilization persisted after the civil war, as did the strategies employed to reach out to young Ethiopians. Some of these strategies were implemented through newer technology, such as the civic education program offered by Schoolnet, while others represented a simpler extension of models that had proven successful in the past.

Schoolnet, however, was not only intended to educate students. Through an analysis of the architecture employed to transmit messages from Addis Ababa to the secondary schools, it became apparent that the system was designed to target other uses beyond the transmission of pre-recorded classes. In contrast to the videoconferencing used by Woredanet, which was designed to be bidirectional, Schoolnet was based on static content and required no interactivity between central and remote sites. If this had been the only use the system was designed for, employing a satellite to broadcast classes was not the most efficient mode of delivery. The provision of high-quality education to both urban and rural areas, as well as the training in the principles of the state, could have been provided more easily and less expensively in other ways; for example, by saving all lessons on hard disks mounted on a local server.[16] As a young foreign consultant who visited some Schoolnet sites noted:

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14. Interview with Bereket Simon, Minister of Communication, Addis Ababa, Ethiopia, June 24, 2008.

15. See, e.g., Young (1997).

16. A basic Schoolnet outlet needed at least a VSAT, decoder, router, and switch. Using a videoserver and hard disk would have required a capacity of around 150 GB, a reasonable capacity for a hard disk, even in 2004. According to the Educational Media Agency (EMA), the institution managing Schoolnet, there were 2,978 classes when the system started, and once digitized in an audio video interleave (AVI) format, a single class occupied around 50 MB.

> The first time we saw Schoolnet we were shocked. They rented a satellite to broadcast pre-recorded content. Whoever designed it was crazy. The content is static. It would have been so much cheaper to buy hard drives and install the lessons on them. A big video server would have been much cheaper.[17]

Even if Schoolnet, like Woredanet, had many weaknesses, the reason for its particular configuration was not the folly of its designers, but simply the fact that it was designed not only to reproduce the same educational content, but also to broadcast new messages when needed. When the students were not in school, the system was used as a platform for other training, including political training of the kind the TPLF had experimented with in the bush. In this sense, Schoolnet complemented Woredanet. While the latter was used to reach officers in the state apparatus, the former was an instrument to communicate with larger audiences.

While Woredanet and Schoolnet were designed to respond to different needs, they are not separate programs, but rather, complementary expressions of a similar need for political control reaching all the way to the state's borders. Woredanet and Schoolnet emerged as the incarnation of a serious commitment to development, providing greater educational opportunities and better services, but they were also aimed at coercing greater political acceptance of those in power and reducing the political space available for critique and alternatives.

8. Discussion: Technopolitics and Development

Woredanet and Schoolnet are examples of how ICTs can be subjected to intense conflicts and negotiations, and of how ICTs can be entangled in the networks of powers and discourses that characterize a specific location. The Ethiopian government was able to reshape new technologies in ways that profoundly challenged the agenda promoted by Western donors, which tended to assert development, liberalization, and individual rights as part of the same package. The ways in which the reshaping process took place also challenge established frameworks used to understand processes of technological adoption or resistance in developing countries.

First, contrary to deterministic accounts of technological diffusion, a consideration of technopolitics illustrates the way that, at a macro level, considering the nation as a whole and the technological systems that were developed within its boundaries, the linear model of the technological transfer of innovations does not always hold. Even in resource-scarce Ethiopia, considered a "darling" of the development community, the government managed to adapt technologies to respond to the urgency and ambition of its own political agenda.

Second, the evolution of Woredanet and Schoolnet tests some aspects of more critical accounts of ICT diffusion, which stress how rich nations are locking poorer ones into new paths of dependency (Wade, 2002). While implementation of the two systems confirms that a developing country such as Ethiopia still must rely on external resources and skills to implement complex ICT projects, it also indicates that governments have greater room for maneuvering and deciding which agenda to follow. Contrary to explanations indicating how Western companies are providing both the vision and the resources to implement it (Leye, 2007; Wade, 2002), the Ethiopian example offers a more complex image of corporations operating in the global ICT sector. These companies may advocate an open vision of the information society, yet still work for governments supporting very different conceptions of ICTs' role.

Third, while Woredanet and Schoolnet can be considered further instantiations of authoritarian regimes' abilities to capture ICTs (Deibert et al., 2008; Kalathil & Boas, 2003; Morozov, 2011), these examples also suggest that, while the type of regime may explain how power is distributed and which actors are able or unable to shape the ICT agenda in a given country, the trope of the authoritarian regime's control of ICTs is less useful in explaining the outcomes of ICT adaptations.

At this level, to better capture the outcomes of negotiations between technical possibilities and political ambitions, the concept of technopolitics proves particularly powerful. The concurrent mapping of the particular discourses animating Ethiopian politics at the time the ICT agenda reached the country, as well as the

17. Interview with an ICT and education consultant, Addis Ababa, Ethiopia, April 24, 2008.

technological possibilities that were disclosed by a greater availability of artifacts and skills at the global and local levels, shed new light on why ICTs took the shape they did. To incorporate the notions of ethnic federalism and revolutionary democracy that uniquely characterized the state- and nation-building project pursued by the EPRDF, important technical features had to be modified, often radically. Artifacts designed to perform given sets of tasks in specific environments had to be combined to complement new environments in ways that had never before been attempted. As a report commissioned by the Ethiopian government from an independent evaluator stressed, these adaptations could be highly problematic:

> There is not only a real risk of the Woredanet service network becoming operationally unsustainable, but also that the project may become financially and economically unsustainable. All this is necessitated by a requirement for a videoconferencing service which cannot ordinarily be accommodated by the HNS DirecWay VSAT platform [the technology that Hughes Network employed to comply with the Request for Proposal]. (Daedan, 2004, pp. 10–11)

The concept of technopolitics also facilitates the analysis not simply of how politics can capture technology, but of how technology constrains politics, and how the two elements become part of a process of mutual reshaping and reconfiguration. The trajectory of the Internet as a service offered by Woredanet exemplifies these phenomena. Internet was initially requested as one of Woredanet's core features. By the time the Ethiopian government formulated an RFP in 2002, browsing the Web and sending emails had become expected, standard features of a project employing ICTs to improve the efficiency of a state apparatus and its capacity to communicate with its nodes. When Woredanet started taking shape, however, the centrality of videoconferencing over other services led to a limitation on the bandwidth available for accessing the Internet. In addition, the architecture that was implemented made data communication within Ethiopia easier, while it strongly limited the possibilities of visiting websites hosted outside the country. At a later stage, when the negative repercussions of the lack of bandwidth on the use videoconferencing emerged, even the thin share allocated for the Internet started to be employed for videoconferencing sessions, effectively eliminating the possibility of browsing the Web. As a result, the application that, probably more than any other, contributed to triggering a new wave of ICT4D campaigns was progressively marginalized in order to respond to other, more local agendas. There were no explicit requests to make browsing a webpage through Woredanet difficult. It was only when the Internet started to interact with other services that its relative importance for Ethiopian leaders became apparent. The redundancy embedded in the system as a result of conflicting global and local influences started to decrease, allowing some features to prevail over others. Against the assumptions of those who celebrate the transformative power of the new technology, the Internet showed little capacity for holding its ground against local demands.

9. Conclusion

This article has offered a practical illustration of how critical discrepancies exist between interpretations of the role of ICTs for development emerging at the international and national levels, and of the ways they can lead to processes of substantial technological reshaping. Building on the concept of technopolitics as it emerged in the history of technology tradition, this article has analyzed how the technical and the political interacted practically in the design and implementation of two ambitious ICT projects envisioned by the Ethiopian government, Woredanet and Schoolnet, magnifying certain aspects of ICTs while marginalizing others. By integrating conceptualizations of technology held by individuals who played a key role in shaping the path of ICTs with observations of how Woredanet and Schoolnet were progressively implemented, this article has reconstructed how the Ethiopian government bent ICTs to serve the ambitious nation-building project pursued by the EPRDF. Woredanet and Schoolnet were designed to perform the complex tasks required to rebuild Ethiopia as an ethnic federation, empowering local administrations without incurring the risk that they could fall outside the orbit of the leadership at the center. The two systems were crafted to reiterate key messages to lower tiers of the administration and the broader Ethiopian society, as articulated in the concept of revolutionary democracy, which encourages direct contact between a vanguard party and the masses.

An advantage of adapting the concept of technopolitics to studying ICTs and development is that, rather

than starting from normative principles and asking whether the application of ICTs may promote democracy or human rights or good governance, it encourages researchers to examine how different actors in a given society interpret technology in relation to both the agendas they want to promote and whether they are able to turn their visions into reality. This approach to studying ICTs and development creates greater room to capture the complexities and contradictions of technological adoption and adaptation in developing countries, without losing sight of both the ideational and technical forces that lead to particular outcomes.

The concept of technopolitics, however, also has a major weakness when it comes to its inability to offer a comprehensive evaluative framework. While the concept permits the capture of the way a local discourse (e.g., ethnic federalism) may intervene in shaping ICTs, and even offers the possibility to evaluate whether and how the resulting technological assemblage performed the goal it was envisioned to achieve (e.g., helping to build Ethiopia as an ethnic federation), it provides little insight into evaluating whether the outcome to which a particular technological assemblage contributed is positive or negative. Is it a positive development that, through Schoolnet, Ethiopian students in rural areas now have access to the same educational material as their peers in urban areas? Or that better coordination of the administrative structure is achieved by allowing the center of the state to exercise greater control over the peripheries?

This weakness can be addressed by combining the concept of technopolitics with evaluative frameworks (e.g., the human capability approach) to enable researchers to understand whether the goals achieved using a specific assemblage align with what people value. At the same time, mapping how specific forms of technopolitics emerge can be particularly useful to researchers and policy makers who are interested in understanding why and how ICTs take the shape they do, especially when the results of the technological reshaping process are at odds with mainstream international agendas. Systems like Woredanet and Schoolnet cannot simply be considered a temporary outcome of a transition that will eventually lead to more "appropriate" ICT uses; these systems are the result of an enormous investment by a poor country with significant implications for the lives of its citizens. ■

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