

# REFLECTIONS ON ALTERNATIVE INTERNET MODELS AND HOW THEY INFORM MORE MINDFUL CONNECTIVITY

Morgan Vigil-Hayes<sup>1</sup>, Jeanna Matthews<sup>2</sup>, Amelia Acker<sup>3</sup>, Daniel Carter<sup>4</sup>

<sup>1</sup>Northern Arizona University, <sup>2</sup>Clarkson University/Data and Society, <sup>3</sup>University of Texas at Austin, <sup>4</sup>Texas State University

---

**Abstract** – *Internet access is often touted as the means by which communities will become more productive, educated, healthier, safer. While Internet access is becoming increasingly ubiquitous, high-speed, and affordable, some communities without ubiquitous Internet have developed hybrid strategies, or alternative Internet models, that allow them to get many of the benefits of constant connection. In this article, we argue that even communities with ubiquitous Internet have much to learn from these successful hybrid models, especially when considering the mental and relational health of communities. We survey a handful of communities that through necessity or choice are using alternative Internet models that deliberately turn off portions of the typical Internet dial-tone including the delay-tolerant networks of extremely remote communities, Internet cafés used as low-cost communal points of access, El Paquete Semanal (Cuba’s offline Internet alternative), and communities of “preppers” who seek to prepare for the collapse of modern infrastructure. We use the experiences of these communities with alternative Internet models as a lens through which to consider more mindful models of Internet consumption that might allow us to reap some of the proven benefits of Internet connectivity while avoiding some of its more damaging side effects.*

**Keywords** – Alternative Internet Models, community networks, mindful Internet

## 1. INTRODUCTION

In a society where Internet connectivity is associated with opportunity, productivity, safety, and profitability, imagining a world with *less connectivity* may seem unorthodox. However, there is a growing awareness of the damaging effects of constant connectivity on mental health and the health of communities. Around the world, we find communities who, have by choice or necessity crafted hybrid Internet models that achieve many of the benefits of ubiquitous connectivity, while simultaneously reducing exposure to the more damaging aspects.

When Internet access is ubiquitous and affordable, it can be difficult as a society to practice mindful consumption. We expose ourselves to invasive surveillance [55, 71] and pop-up alerts that break our concentration and interrupt our sleep [49, 39]; we compulsively engage with platforms designed to addictively captivate our attention [4, 60] and manipulate our mood [41]; we selectively isolate ourselves into culture bubbles and cease to discern informational validity and integrity [61, 28, 63]. Unfortunately, this lack of mindfulness can negatively impact our mental health, personal relationships, government and communities.

In this paper, we survey a handful of Alternative Internet Models (AIMs) in which users consume Internet content in ways that deviate from the “always-on, ubiquitous, high-speed” model of Internet connectivity that society has come to hold as the gold standard of connectivity. We use this as an lens through which to consider ways to achieve a majority of the benefits of high-speed

Internet connectivity with fewer of the risks and injuries.

## 2. ONLINE, OFFLINE AND HYBRID STATES OF CONNECTIVITY

Internet connectivity is typically perceived as a binary state with regards to individuals and communities; they either have Internet connectivity or they do not. In reality, connectivity takes place on a spectrum. On one end of the spectrum, communities have affordable, ubiquitous, high speed Internet access; on the opposite end, Internet connectivity is not available at all [34, 35]. In between these extremes are other realities. Some communities may have ubiquitous, affordable, high speed Internet in 95% of the land area where they exist, but also face coverage shadows (e.g., behind a hilltop or in a parking garage) that prevent true ubiquitously accessible broadband. Some communities may have affordable Internet access at homes, but lack mobile broadband access around neighborhoods [16, 66].

Beyond the spectrum of connection speeds and coverage, there are variations in how content is curated and searched. For curation, the information seen by most Internet users is dominated by the often black-box curation choices of platforms like Facebook, Twitter, and Google. Increasingly, the news and information we consume is dominated by social media algorithms and less by legacy media gatekeepers like the main stream media outlets [20]. These algorithms can change unexpectedly and are primarily optimized for ad revenue and user engagement. In other word, users are shown content that

the platforms believe they will want to see and that will keep them coming back more regularly. There are also examples of deliberate manipulation of these algorithms to amplify extreme political positions [44, 10, 53, 28]. The main type content moderation is the removal of illegal or extreme content [22, 43, 40]. Much like the spectrum of Internet connection speeds, choices for curation, moderation and search provide a spectrum of choices for self-moderation and community moderation.

### 3. ALTERNATIVE MODELS OF THE INTERNET

Given the broad continuum of what it means to be online or offline with respect to the Internet, it is possible to reimagine societal notions of Internet connectivity that function beyond traditional assumptions and/or aspirations of ubiquitous, high-speed, affordable Internet access available at all times. We will refer to these as *Alternative Internet Models* (AIMs). AIMs are well-articulated ways that communities access the Internet that involve a voluntary or necessary cessation of end-to-end Internet connectivity or common Internet features such as search or platform-based content moderation. This definition allows for many prevalent network architectures to be included as AIMs. For example, web caches allow web content to be stored on a user's device, device-to-device applications allow data sharing to occur without requiring cloud access, and asynchronous modes of communication assume periods of disconnection (if not in a networked sense, then in a behavioral sense). To focus the discussion in this paper, we consider models that hybridize some of the benefits of the traditional Internet model with alternative modes of content delivery, content creation, content dissemination, content search, and the environment associated with content access.

In this section, the authors describe alternative Internet models that are used in different communities around the world or that have been proposed in the research literature. Specifically, we examine examples of AIMs that illuminate benefits of the alternatives.

**Delay-Tolerant Networks (DTNs).** One of the quintessential examples of an alternative model of Internet access are DTNs [23]. Traditionally characterized as an architecture that supports networking in challenged environments (i.e., models where regular partitioning of the network is not well-served by traditional TCP/IP), DTN architecture has been leveraged in contexts that range from mobile ad-hoc networks to interplanetary networks [37, 8, 3, 31, 32]. More recently, DTN architecture has been extended to unmanned aerial vehicle (UAV) networks, which can be used as a backbone for Internet access points [47, 14]. For the context of this paper, some of the most interesting DTNs are those that enable communities in extremely remote areas to occasionally access the Internet.

One well-studied example of a DTN being used in a community is DakNet [52]. Developed as an architec-

ture by the MIT Media Lab in the early 2000's, it was deployed in remote communities of Cambodia and India as a cost effective means for access to data from the Internet. Critically, all Internet connectivity was asynchronous, meaning that users would receive or interact with content from the Internet separately from connectivity to the Internet. For initial iterations of DakNet deployments, users would use DakNet to send and receive emails by posting email messages to a community access point on a local area network. Then, on a regularly scheduled basis, a bus outfitted with an access point would park near the access point and would download all of the outgoing messages to addressed to users on the Internet to a data storage device on the bus (simultaneously, it would upload all data on the storage device addressed to a particular access point to that access point). The bus would then traverse its route and eventually come to an access point with a simultaneous, end-to-end connection to the Internet. At this point, the access point on the bus would send all outgoing messages to appropriate destinations on the Internet and would receive all messages destined for community access points located along its route.

While mechanical backhaul (i.e., non-digital backhaul) is an inexpensive option, it has impacts on how Internet connectivity is used. As reported in observations of usage of DakNet and other DTN deployments, the asynchronous nature of connectivity compelled intentionality [56, 13, 12, 52]. For example, users would go to a community access point and spend significant time composing a single email or forming a search query due to the high time penalty for misaddressing or misquerying. Similarly, users would schedule visits to the access points to check for receipt of messages or answers for previously posted queries. While there are benefits to this exceptional intentionality such as decreased exposure to some of the addictive, disruptive, and deceitful facets of Internet content [55, 71, 49, 39, 4, 60, 41, 61, 28, 63], the model limits the types of information and activities in which a user can engage, especially as Internet content has increased in complexity [30]. For instance, real-time, Internet-based interactions would be impossible with this model. There are also facets to the DTN model that require more human management. For example, users may need to deliberate through their schedules and identify appropriate time slots in which they decide to compose content, travel to community access points to send and receive content, and review received content. Even more complex, users may authorize other people to deliver and pickup content from the asynchronous access points on their behalf, which require that mechanisms for collaboration and trust are woven into communal conceptualizations of the Internet if not the network architecture itself.

Thus, the DTN is one of the most extreme versions of an alternative Internet model, where connectivity across space is dichotomous and all data interactions must be asynchronous. The model represents one end of a spec-

trum of alternative Internet models that sits closest to the disconnected end of the Internet connectivity spectrum. In the following subsections, we discuss models of alternative Internet access that fall between this point in the spectrum and the traditional model of ubiquitous, always accessible Internet access.

**Communal Access Points (CAPs).** One of the most common models that communities adopt prior to receiving affordable residential Internet access is to leverage communal points of connectivity, typically referred to as Internet kiosks, Internet cafés, or hot spots. There are several models of CAPs. In one typical model, access is established through the initial connectivity of critical anchor institutions, such as libraries, schools, or health clinics. Often times, government programs can help subsidize the deployment of initial gateway connectivity, which can allow these public entities to offer low-cost public Internet access at limited rates during day-time operation [21, 24, 27]. Another model involves private entities purchasing an Internet subscription or building Internet infrastructure to their premises and then advertising the presence of “free WiFi hotspots” for customers. A final communal access model includes the creation of Internet cafés as a business unto themselves, where customers come to the café and purchase short-term Internet access based on time or data capacity.

Anchor institution CAPs vary across communities and landscapes. Typically, connectivity available at schools is reserved for students, faculty, and staff and is typically only available during business hours (i.e., 7am–6pm on weekdays). However, new models leverage TV white space technology, a wireless network technology that uses the historic TV broadcast band of the radio spectrum for data transmission, to extend the amount of times students are connected to the Internet. For example, Microsoft has proposed mounting TV white space antennas on school buses to enable students who are bussed from rural areas to have an extended period of Internet access during their rides to and from school so they can work on homework before returning to poorly connected homes [46]. Libraries can offer a broader span of usage with respect to time and population and have been critical to innovating how communal access takes places. For example, the Gigabit Libraries Network would allow libraries to operate neighborhood-scale TV white space access points that would not require patrons to connect to the Internet *in situ*, but from anywhere in an entire neighborhood [7, 27]. Critically, this would allow library-based Internet access beyond library operating hours and could ameliorate access for patrons who are unable to easily access physical library buildings.

A couple of atypical anchor institution CAP models that serve as interesting AIMs are the WiFi parks in Havana and the NGO-based Internet cafés in European refugee shelters. In 2015, public squares of Havana, Cuba were converted to outdoor public WiFi access points and Internet access was rationed through cards which allowed people to pay for access time [19]. While the model

proved to be extremely popular, the lack of centralized coordination led to constantly overloaded (and underperforming) WiFi access points and people would go on extensive searches “looking for the Internet,” i.e., trying to find an operational access point that would allow them to optimize their access time. Another interesting model is the NGO-funded Internet café operated out of refugee shelters in Germany [72]. While a study of these CAPs revealed that they played a critical role in assisting refugees in general, especially in solidifying a digital diaspora community, it also demonstrated that cyber activities that take place in a communal space are not removed from gender-based cultural expectations of real-world activities that take place in communal spaces. This was a significant limitation on how women were able to engage with the Internet in order to create disseminate, and receive information.

One of the most prevalent communal access model is the private “free hot spot”. In cafés, restaurants, stores, and airports, accessing “free” Internet can be as simple as finding the appropriate WiFi SSID (Service Set Identifier) and verifying an agreement statement (or entering the publicized WiFi password). These spaces have different significance depending on where they might be located. In urban spaces, the free hot spot can be a place where users choose to access Internet content over a less congested network, rather than use frequently congested cellular network infrastructures [15]. In rural spaces, free hot spots can be information lifelines—the only point of Internet access for tens of miles. An example of the importance of these free hot spots is in Indian Country, the rural lands held in trust by the U.S. federal government for sovereign tribal nations. Only 63% of people living in Indian Country have broadband Internet access and the nearest access point can be over an hour’s drive away [25, 58, 64]. People living in these communities report experiences where they have spent the night working outside of hotels and restaurants that provide free hot spots so that they could keep up with online coursework or submit digital government forms before deadlines. While these free hot spots can be a pivotal means of connecting to the Internet, they are still few and far between in rural areas and subsequently, there is a time and fuel cost associated with traveling to points of access even if a user is not consuming any of the products sold by the entity providing the access.

In contrast to the free hot spot model is the for-profit Internet café. One of the most cited studies of Internet café-for-profit environments takes place in Accra, Ghana. Using ethnographic fieldwork methodologies, Jenna Burrell spent over a year in Accra observing and interviewing customers at six different Internet cafés, and highlighted how youth who operate in the margins of the digital economy are particularly able to incorporate both traditional nontraditional technologies into their repertoire of Internet access strategies [9]. Similar studies conducted in Turkey [29], Pakistan [5], Nigeria [2], Indonesia [69], and London [70]—and they have

revealed similar findings and have also demonstrated the economic benefit the communal model can have. Notably, this model is much more prevalent in developing regions, likely given the lack of ubiquitous home Internet access and affordable subscription rates in these areas [33, 34, 35, 36].

CAPs are so prevalent because their cost can be quickly amortized by the volume of people leveraging infrastructure in exchange for increased public good (i.e., anchor institution model), increased marketability (i.e., “free hot spot” model), or for straight profitability (i.e., Internet café model). Critically, they have repeatably demonstrated their ability to successfully jump-start an information economy when Internet access is not ubiquitously accessible to a community.

**Community Curated Content.** Some communities have been isolated from the greater global Internet due to political-driven policies. Cuba has one of the highest rates of literacy and education in the world, but also one of the lowest rates of direct Internet access. Most direct Internet access in Cuba is through outdoor public WiFi parks where access is expensive (approximately \$1 USD per hour of access from an average Cuban salary of \$30 USD per month), inconsistent, and inconvenient in comparison with persistent mobile access. However, direct Internet access is only part of the story in Cuba. Cubans have also developed unique and robust offline systems for distributing digital content through removable storage media like USB thumb drives and portable hard drives called El Paquete Semanal (The Weekly Package) [17, 6]. Thus Cubans use a fascinating online-offline hybrid model for Internet access, which while developed out of necessity, has a number of advantages worth considering more broadly.

El Paquete Semanal is a collection of digital material distributed since approximately 2008 in the unofficial Cuban marketplace as an Internet alternative. It has been called Cuba’s Google, YouTube, Netflix, Hulu, and Spotify – all without the Internet [68, 38]. Updated and distributed every week, it contains a diverse collection of digital content, both downloaded from abroad and produced within Cuba, movies and TV shows (including new releases), music and music videos, video games, sports programming, digital magazines, books, religious materials, mobile and PC applications, and entire copies of websites including Wikipedia and Revolico, a Cuban Craigslist-style marketplace. The distribution of El Paquete, while not officially sanctioned by the government, has clearly been permitted by way of a lack of government disruption. One reason it is so widely tolerated is that it does not contain content that is anti-government, subversive, obscene, or pornographic, following the “no politics, no pornography” policy common within Cuba [68, 54]). Much of the content is under copyright in other countries and would be considered pirated material, but this is socially acceptable and legal in Cuba, where intellectual property laws and norms are markedly different. Each week, content curators assemble their content sec-

tions and pass those sections to a high-level distribution team known as a *matriz*, which in turn assembles the full package. The finalized package is then passed on to mid-level distributors, who pass it on to other smaller distributors and so on, eventually reaching consumers. The collection received by an end-user typically passes through several mid-level distributors, particularly for end-users outside of Havana. Starting in Havana, El Paquete content is distributed to all the provinces of Cuba through a system of hard drives passed via car, plane, train, and bus. Mid-level distributors often modify the contents, particularly in order to remove content not of interest to their customers (reducing the size of their distribution), or to add content such as local content of interest in parts of Cuba outside of Havana.

*Matrices* also add advertisements to some content, and it is reported that income from these advertisements rivals income from fees paid by users for the content itself [38]. *Matrices* also play a role in sponsoring and encouraging the production of unique content, exclusive to their version of El Paquete. In this sense, *matrices* play a variety of roles ascribed to traditional production studios and TV channels, taking care of distribution, selling advertising and sponsoring the production of exclusive content.

The distribution of El Paquete is a network of human relationships rather than a network of Internet routers and other infrastructure. It builds on, strengthens and exploits existing human relationships and distribution systems developed over many years to distribute first magazines and novels from abroad and then VHS/DVD movies and finally Internet content. Distribution based on human relationships make participants less vulnerable to centralized surveillance or manipulation, but potentially more vulnerable to monitoring and manipulation by people close to them in the distribution chain. However, it is worth considering that individuals are always more vulnerable to those physically close to them, but a system based on existing relationships reduces the vulnerability to remote and centralized monitoring and manipulation introduced by Internet platforms.

El Paquete represents one very successful means of addressing a particular set of constraints, challenges, and opportunities that confront people in Cuba today. It also offers an opportunity to consider hybrid models for Internet consumption even in communities where direct access is affordable and ubiquitous. Offline access models like El Paquete offer a means of avoiding online tracking/surveillance models that are common in other regions. Offline access provides for one type of anonymity of access: more visibility to people close by in the distribution system, but less surveillance from government or corporate entities. While not the case in Cuba, DTN systems like El Paquete have been used to avoid government censorship for example in North Korea where USB drives loaded with a variety of entertainment and educational content offer an alternative to tightly controlled government propaganda [45, 26].

One of the key challenges of adopting an AIM inspired by El Paquete is the model for monetizing use. There are opportunities for distribution and advertizing income, but because consumption is offline, users are not as directly surveillable, negating models that rely on generating revenue through user profiles.

Some additional lessons arriving from Internet usage in Cuba is that most users do not navigate via constant Internet connection to Google maps or similar services. Instead, users download maps and then navigate using GPS. Similarly, many apps like the popular restaurant guide application, “A La Mesa”, also work by downloading a database of restaurant data when connected and then consulting that database in offline mode. There are both additional examples of the lessons from Cuba’s online/offline hybrid model of Internet consumption.

There is a common saying, “if you are not paying then you are the product”. This is true but increasingly it is the case that even when you are paying you are the product. Companies sell more than content and advertizing to users; they sell the details of how users consume their content. For example, exercise-tracking devices like Fitbits. They could offer an interface that allows consumers to view their own data, gain insight from it and then share only what they want. Instead, they require all data to be given to the platform for viewing by consumers. Even though users have purchased an expensive tracking device, their usage data is also sold and in many cases is as valuable as the devices sold. Offline access models common in Cuba offer an opportunity to rethink this ubiquitous model of user tracking.

**Post-disaster Networks.** As the frequency of large-scale natural disasters increase, some communities have developed network infrastructure for Internet connectivity post-disaster; some communities prepare for what they view as inevitable disaster. Preppers are individuals who gather and stock supplies, food, and tools in anticipation of disasters, emergencies, or “the end of the world”. In the process of making themselves ready for disaster, many preppers have built community on social networking sites and online platforms discussing how they will continue to thrive and connect in a world of resource scarcity and political instability. These preppers practice survival skills, stockpile nonperishable foods and construct fortified “bug out locations” where they can go in an emergency. However, preppers also design and construct computing devices, and these activities have received little attention.

Preppers exhibit a deep and relevant engagement with the future of computing and argue that their perspectives differ from those of scholars in ways that can productively draw attention to new concepts and topics [48]. Most notably, preppers as a case study of planning and preparing for an alternative Internet, contribute to ongoing discussions around networked computing’s possible futures by distinguishing between two perspectives: one that imagines computing devices as scarce and focuses on customization and maintenance

and one that sees these devices, due to current manufacturing patterns, as remarkably abundant. The description of these perspectives can broaden understandings of alternative technical practices and draw attention to emerging areas of concern, such as the tension between maintenance as a sustainable practice and current production practices [65].

While studies and essays predicting faster computers and increasingly frictionless networking have a long history, in recent years scholars have questioned such narratives by pointing to the current unsustainable pace of resource consumption, as well as by describing alternative technical practices in areas such as the global South. Within the area of collapse informatics, for example, scholars pursue the “study, design, and development of sociotechnical systems in the abundant present for use in a future of scarcity” [62]. Similarly, scholars of technology use in the global South have highlighted practices and infrastructures that, in the present, negotiate the kinds of resource scarcity and disruption imagined by scholars looking ahead to collapse. Patterson, for example, describes the equipment and practices involved in accessing the Internet in Haiti following the 2010 earthquake [51]. Similarly, Silva, Farman and Bueno work to expand conceptions of mobile phone use and network access by describing the circulation of phones in Rio de Janeiro [57]. These studies expand the available conceptions of networked computing, focusing attention on ad-hoc configurations and repair practices that are less visible in countries such as the U.S. However, preppers largely located in the U.S. and have access to the resources and infrastructures currently available there, they also imagine and at times enact possible futures in ways that reveal novel perspectives. Acker et al. developed the description of preppers’ perspectives through an analysis of over 800,000 posts to a popular prepper forum [1]. The analysis highlights two perspectives on the future of networked computing that rely on preppers’ relationships and reliance on devices and networking equipment. The first is the notion of cherishing and maintaining network infrastructure *vis-à-vis* networking equipment. Some forum members assume that equipment needed for networked computing will be scarce in post-collapse futures. This assumption is strongly linked with the desire to construct or fabricate highly customized devices that would be carefully maintained. For Internet researchers concerned with infrastructure resilience and computing within limits, these perspectives of future scenarios draw attention to alternative technology practices and to new areas of concern such as the future use of existing devices by way of imagining alternatives to critical digital infrastructure by preparing for post-collapse scenarios.

## 4. CONCLUSION

In this article, we have surveyed a handful of Alternative Internet Models (AIMs) in which users consume content

**Table 1** – Examples of alternative Internet models used by different communities.

| AIM                              | Example Use Cases   | Benefits   | Challenges  |
|----------------------------------|---|--|---|
| <i>Delay Tolerant Networks</i>   | SMSFind [12], RuralCafe [13], Daknet [52], KioskNet [56]                                    | Low-infrastructure, promotes mindful information querying and content access               | Does not support content that requires end-to-end connectivity, viewed as “second-class” Internet |
| <i>Community Access Points</i>   | WiFi parks [19], Libraries [21, 24, 27], Internet cafés [9, 29, 5, 2, 69, 70, 72]           | Highly scalable, promotes mindful information quering and content access                   | Lack of privacy, dependent on social contexts surrounding access points                           |
| <i>Community Curated Content</i> | El Paquete Semanal [18, 6], North Korea [26], MOSES [59], mobile media sharing [50, 42, 11] | Community values reflected in content selection  | Potential for censorship and information insularity, complicated finance models                   |
| <i>Post-disaster Networks</i>    | Prepper communities [1], Haitian Internet [51]  | Emphasis on maintenance and sustainability, expanded conceptions of networked technologies | Current production practices not ammenable to self-sustainability                                 |

in ways that deviate from the “always-on, ubiquitous, high-speed” model of Internet connectivity that society has come to hold as the gold standard of connectivity. While AIMS have typically been viewed as inferior to ubiquitous connectivity, we seek to bring new insight as to how these models may be complementary. Critically, these hybrid models might allow us to realize many of the benefits of constant Internet connection without some of its damaging side effects. We present specific examples of the different AIMS discussed as well as the corresponding benefits and challenges in Table 1.

When examining the array of examples of Alternative Internet Models, there are a few critical benefits that emerge from each model (aside from the typical benefits afforded by Internet connectivity) that can be collectively characterized as enhanced mindfulness around Internet engagement. In the delay-tolerant network model, users are compelled to be more intentional with their interactions with network infrastructure. Asynchronous interactions require that content be carefully crafted in order to minimize latency. For both delay-tolerant networks and communal access models, time must be mindfully set aside or interpersonal trust must be established in order to enable content transfers that require intentional travel to spaces of asynchronous or synchronous Internet connectivity. El Paquete Semanal facilitates community-oriented content curation—providing a context wherein content interaction is not seen as a purely individualistic endeavor, but a community collaborative effort for identifying that which is most relevant and most important. Cuban Internet usage also provides inspiration for alternate models of application development including downloading needed maps and databases and then navigating with GPS rather than constant Internet connection. This model of offline access makes real-time tracking and surveillance of users more difficult. Finally, as prepper communities considers the possible end of modern society, there are serious considerations about what is essential for continued internetworking in a post-apocalyptic world, as well as whether our current Internet usage is driving us ever more swiftly to the apocalypse. Thus, in this community, the Internet is mindfully considered in the context of its physicality as well as its role as a potential instru-

ment of global disaster. The authors believe that the mindfulness that characterizes Internet engagement in these models points to necessary future work that seeks to understand how developers and architects can build mechanisms for mindfulness into the design of networks and networked services and how communities might engage in a manner that contributes to mindful engagement. In a world with growing awareness of the harms of the standard Internet dial tone (surveillance, distraction, addiction, manipulation), these Alternate Internet Models offer a way to imagine a new future for people who do not currently see a way to be citizens of the modern world without constant connectivity.

It is also important to consider some of the potential consequences of adopting an AIM. One of the most critical is the potential to get stuck with “second rate Internet.” This is a particular concern for communities that may have to adopt AIMS because they are not well-served by the telecommunications market. For example, DakNet, which was originally designed to support the asynchronous-friendly content that was typical of the majority of content on the Internet (e.g., static web pages, email, SMS), would be a very second-rate model of the Internet today given the increased personalization, complexity, and interactivity that is now embedded into the majority of Internet content and activities. Another drawback is that community content curators may not always act in best interests of the communities they serve. While we observe many examples where platform-based curation is in the interest of ad revenue rather than users and communities, other types of curation have dangers as well. For example, when people act as content curators for their friends on certain web-based platforms (e.g., Facebook or Twitter), content is shared freely regardless of integrity and regardless of social impact [67]. To this end, the authors also argue that there is a need for investigation into potential consequences of AIM adoption given what we already know about Internet growth, human-computer interaction, computer-supported cooperative work, and online social interactions. Critically, in light of costs and benefits associated with AIMS, future research should critically ask: *How do our communities change as a function of our Internet models?*

## REFERENCES

- [1] Amelia Acker and Daniel Carter. 2018. Pocket Preppers: Performing Preparedness with Everyday Carry Posts on Instagram. In *Proceedings of the 9th International Conference on Social Media and Society*. 207–211.
- [2] Esharenana E Adomi. 2007. Overnight Internet Browsing Among Cyber café Users in Abraka, Nigeria. *The Journal of Community Informatics* 3, 2 (2007).
- [3] Ian F Akyildiz, Dario Pompili, and Tommaso Melodia. 2005. Underwater Acoustic Sensor Networks: Research Challenges. *Ad hoc networks* 3, 3 (2005), 257–279.
- [4] Adam Alter. 2017. *Irresistible: The Rise of Addictive Technology and the Business of Keeping Us Hooked*. Penguin Press.
- [5] Syeda Hina Batool and Khalid Mahmood. 2010. Entertainment, Communication or Academic Use? A Survey of Internet Cafe Users in Lahore, Pakistan. *Information Development* 26, 2 (2010), 141–147.
- [6] Joel Lenin Pinargote Bravo, Rafael Beto Mpfumo, Luis Alejandro Madruga Milanés, Ximena Michelle Cueva, Gretel García Gómez, Amalia Gómez Marcheco, Alberto Fernández Oliva, Jeanna Neefe Matthews, and Sam P. Kellogg. 2018. Lessons from El Paquete, Cuba’s Offline Internet. In *Proceedings of the 1st ACM SIGCAS Conference on Computing and Sustainable Societies (COMPASS ’18)*. ACM, New York, NY, USA, Article 11, 12 pages. DOI:<http://dx.doi.org/10.1145/3209811.3209876>
- [7] Andrew Burger. 2017. Gigabit Libraries Network Announces Five Library TV White Space Project Awards. <https://www.telecompetitor.com/gigabit-libraries-network-announces-five-library-tv-white-space-project-awards/>. (May 2017).
- [8] Scott Burleigh, Adrian Hooke, Leigh Torgerson, Kevin Fall, Vint Cerf, Bob Durst, Keith Scott, and Howard Weiss. 2003. Delay-tolerant Networking: An Approach to Interplanetary Internet. *IEEE Communications Magazine* 41, 6 (2003), 128–136.
- [9] Jenna Burrell. 2012. *Invisible Users: Youth in the Internet cafés of Urban Ghana*. MIT Press.
- [10] Robyn Caplan, Lauren Hanson, and Joan Donovan. 2018. Dead Reckoning Navigating Content Moderation After Fake News. <https://datasociety.net/output/dead-reckoning/>. (February 2018).
- [11] Priyank Chandra, Syed Ishtiaque Ahmed, and Joyojeet Pal. 2017. Market Practices and the Bazaar: Technology Consumption in ICT Markets in the Global South. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI ’17)*. 4741–4752.
- [12] Jay Chen, Lakshmi Subramanian, and Eric Brewer. 2010. SMS-based Web Search for Low-end Mobile Devices. In *Proceedings of the Sixteenth Annual International Conference on Mobile Computing and Networking*. ACM, 125–136.
- [13] Jay Chen, Lakshminarayanan Subramanian, and Jinyang Li. 2009. RuralCafe: Web Search in the Rural Developing World. In *Proceedings of the 18th International Conference on World Wide Web*. 411–420.
- [14] Luca Chiaraviglio, Nicola Blefari-Melazzi, William Liu, Jairo A Gutiérrez, Jaap van de Beek, Robert Birke, Lydia Chen, Filip Idzikowski, Daniel Kilper, Paolo Monti, and others. 2017. Bringing 5G into Rural and Low-income Areas: Is it Feasible? *IEEE Communications Standards Magazine* 1, 3 (2017), 50–57.
- [15] Shuo Deng, Ravi Netravali, Anirudh Sivaraman, and Hari Balakrishnan. 2014. WiFi, LTE, or Both?: Measuring Multi-homed Wireless Internet Performance. In *Proceedings of the 2014 Conference on Internet Measurement*. 181–194.
- [16] Marisa Elena Duarte. 2013. *Network Sovereignty: Understanding the Implications of Tribal Broadband Networks*. Ph.D. Dissertation.
- [17] Michaelanne Dye, David Nemer, Josiah Mangiameli, Amy S. Bruckman, and Neha Kumar. 2018a. El Paquete Semanal: The Week’s Internet in Havana. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI ’18)*. ACM, New York, NY, USA, Article 639, 12 pages. DOI: <http://dx.doi.org/10.1145/3173574.3174213>
- [18] Michaelanne Dye, David Nemer, Josiah Mangiameli, Amy S. Bruckman, and Neha Kumar. 2018b. El Paquete Semanal: The Week’s Internet in Havana. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. 639.
- [19] Michaelanne Dye, David Nemer, Laura R. Pina, Nithya Sambasivan, Amy S. Bruckman, and Neha Kumar. 2017. Locating the Internet in the Parks of Havana. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*. 3867–3878.
- [20] Elisa Shearer E. and Gottfried J. 2017. News Use Across Social Media Platforms 2017. Pew Research Center. (September 2017). [http://assets.pewresearch.org/wp-content/uploads/sites/13/2017/09/13163032/PJ\\_17.08.23\\_socialMediaUpdate\\_FINAL.pdf](http://assets.pewresearch.org/wp-content/uploads/sites/13/2017/09/13163032/PJ_17.08.23_socialMediaUpdate_FINAL.pdf)
- [21] John Eggerton. 2018. Schools & Libraries: We’re Keys to Closing Rural Divide. <https://www.broadcastingcable.com/news/schools-libraries-were-keys-closing-rural-divide-171848>. (February 2018).
- [22] Facebook. 2018. Community Standards Enforcement Preliminary Report. (May 2018). <https://transparency.facebook.com/community-standards-enforcement>
- [23] Kevin Fall. 2003. A Delay-tolerant Network Architecture for Challenged Internets. In *Proceedings of the 2003 Conference on Applications, Technologies, Architectures, and Protocols for Computer Communications*. 27–34.
- [24] Federal Communication Commission. 2018. E-rate: Universal Service Program for Schools and Libraries. <https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate>. (February 2018).
- [25] Federal Communications Commission. 2018. 2018 Broadband Deployment Report. [https://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2018/db0202/FCC-18-10A1.pdf](https://transition.fcc.gov/Daily_Releases/Daily_Business/2018/db0202/FCC-18-10A1.pdf). (2018).
- [26] Flash Drives For Freedom. 2018. Flash Drives For Freedom. (2018). <https://flashdrivesforfreedom.org>
- [27] Gigabit Library Network. 2018. Gigabit Library Network. <http://www.giglibraries.net/about>. (July 2018).
- [28] M. Golebiewski and d. boyd. 2018. Data Voids: Where Missing Data Can Easily Be Exploited. *Data and Society*. (May 2018). <https://datasociety.net/output/data-voids-where-missing-data-can-easily-be-exploited/>
- [29] Gürol and Tuncay Sevindik. 2007. Profile of Internet Café Users in Turkey. *Telematics and Informatics* 24, 1 (2007), 59–68.
- [30] HTTP Archive. 2018. Report: Page Weight. <https://httparchive.org/reports/page-weight>. (July 2018).
- [31] Pan Hui, Jon Crowcroft, and Eiko Yoneki. 2011. Bubble Rap: Social-based Forwarding in Delay-tolerant Networks. *IEEE Transactions on Mobile Computing* 10, 11 (2011), 1576–1589.
- [32] Bret Hull, Vladimir Bychkovsky, Yang Zhang, Kevin Chen, Michel Goraczko, Allen Miu, Eugene Shih, Hari Balakrishnan, and Samuel Madden. 2006. CarTel: A Distributed Mobile Sensor Computing System. In *Proceedings of the 4th international conference on Embedded networked sensor systems*. ACM, 125–138.
- [33] International Telecommunications Union. 2014. The World in 2014: ICT Facts and Figures. <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2014-e.pdf>. (June 2014).
- [34] International Telecommunications Union. 2015. ICT Facts and Figures 2015. <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf>. (June 2015).
- [35] International Telecommunications Union. 2016. ICT Facts and Figures 2016. <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2016.pdf>. (June 2016).
- [36] International Telecommunications Union. 2017. ICT Facts and Figures 2017. <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf>. (June 2017).

- [37] Philo Juang, Hidekazu Oki, Yong Wang, Margaret Martonosi, Li Shiu-an Peh, and Daniel Rubenstein. 2002. Energy-efficient Computing for Wildlife Tracking: Design Tradeoffs and Early Experiences with ZebraNet. *ACM SIGARCH Computer Architecture News* 30, 5 (2002), 96–107.
- [38] Sarah Kessler. 2015. In Cuba, An Underground Network Armed With USB Drives Does The Work Of Google And YouTube. <https://www.fastcompany.com/3048163/in-cuba-an-underground-network-armed-with-usb-drives-does-the-work-of-google-and-youtube>. (2015).
- [39] Nicole Kobie. 2017. It's Time You Turned Off All Those Breaking News Push Notifications. *Wired*. (October 2017). <https://www.wired.co.uk/article/push-notifications-breaking-news>
- [40] Hanna Kozłowska. 2018. Facebook is Revealing Data on How Good It Is at Moderating Content, But the Numbers Have Holes. *Quartz*. (May 2018). <https://qz.com/1277729/facebook-is-revealing-data-on-how-good-it-is-at-moderating-content-but-the-numbers-dont-say-much/>
- [41] Adam D.I. Kramer. 2012. The Spread of Emotion via Facebook. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. ACM, New York, NY, USA, 767–770. DOI:<http://dx.doi.org/10.1145/2207676.2207787>
- [42] Neha Kumar and Nimmi Rangaswamy. 2013. The Mobile Media Actor-network in Urban India. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. 1989–1998.
- [43] Alexis Madrigal. 2018. Inside Facebook's Fast-Growing Content-Moderation Effort. *The Atlantic*. (February 2018). <https://www.theatlantic.com/technology/archive/2018/02/what-facebook-told-insiders-about-how-it-moderates-posts/552632/>
- [44] Alice Marwick and Rebecca Lewis. 2017. Media Manipulation and Disinformation Online. <https://datasociety.net/output/media-manipulation-and-disinfo-online/>. (May 2017).
- [45] Joshua Rhett Miller. 2017. Importing Hope into North Korea, one USB Drive at a Time. *New York Post*. (March 2017).
- [46] Matt Morgan. 2018. Microsoft to Use TV White Space to Put WiFi on Rural School Buses. <https://edtechmagazine.com/k12/article/2018/05/microsoft-to-use-tv-white-space-to-put-wifi-on-rural-school-buses->. (May 2018).
- [47] Mohammad Mozaffari, Walid Saad, Mehdi Bennis, Young-Han Nam, and Mérouane Debbah. 2018. A Tutorial on UAVs for Wireless Networks: Applications, Challenges, and Open Problems. *arXiv preprint arXiv:1803.00680* (2018).
- [48] B. Nardie. 2015. Designing for the Future: But Which One? Interactions. In *Proceedings of the 2017 Workshop on Computing Within Limits*, Vol. 23. 26–33. Issue 1. <https://doi.org/10.1145/2843592>
- [49] Michele Nealon-Woods. 2014. The Impact of the 'Breaking News' Cycle on Our Health. *Huffington Post*. (October 2014). [https://www.huffingtonpost.com/michele-nealonwoods/the-impact-of-the-breakin\\_1\\_b\\_5813138.html](https://www.huffingtonpost.com/michele-nealonwoods/the-impact-of-the-breakin_1_b_5813138.html)
- [50] Jacki O'Neill, Kentaro Toyama, Jay Chen, Berthel Tate, and Aysa Siddique. 2016. The Increasing Sophistication of Mobile Media Sharing in Lower-Middle-Class Bangalore. In *Proceedings of the Eighth International Conference on Information and Communication Technologies and Development (ICTD '16)*. Article 17, 17:1–17:11 pages.
- [51] D. J. Patterson. 2015. Haitian Resiliency: A Case Study in Intermittent Infrastructure . *First Monday*. (2015). Issue 8. <https://doi.org/10.5210/fm.v2018.6129>
- [52] Alex Pentland, Richard Fletcher, and Amir Hasson. 2004. Daknet: Rethinking Connectivity in Developing Nations. *Computer* 37, 1 (2004), 78–83.
- [53] Whitney Philips. 2018. The Oxygen of Amplification: Better Practices for Reporting on Extremists, Antagonists, and Manipulators Online . <https://datasociety.net/output/oxygen-of-amplification/>. (May 2018).
- [54] Eduardo E. Pujol P., Will Scott, Eric Wustrow, and J. Alex Halderman. 2017. Initial Measurements of the Cuban Street Network. In *Proceedings of the 2017 Internet Measurement Conference (IMC '17)*. ACM, New York, NY, USA, 318–324. DOI: <http://dx.doi.org/10.1145/3131365.3131395>
- [55] Bruce Schneier. 2015. *Data and Goliath: The Hidden Battles to Collect Your Data and Control Your World*. W.W. Norton and Company, New York, NY.
- [56] Aaditheswar Seth, Darcy Kroeker, Matei Zaharia, Shimin Guo, and Srinivasan Keshav. 2006. Low-cost Communication for Rural Internet Kiosks Using Mechanical Backhaul. In *Proceedings of the 12th Annual International Conference on Mobile Computing and Networking*. 334–345.
- [57] A. de S. e. Silva, J. Farman, and D. de C. Bueno. 2016. The Life Cycle of a Mobile Phone: Material Cultures of Manufacturing and Consumption. *AoIR Selected Papers of Internet Research*. (2016). Issue 0. <https://spir.aoir.org/index.php/spir/article/view/1056>
- [58] Gerry Smith. 2012. On Tribal Lands, Digital Divide Brings New Form Of Isolation. [https://www.huffingtonpost.com/2012/04/20/digital-divide-tribal-lands\\_n\\_1403046.html](https://www.huffingtonpost.com/2012/04/20/digital-divide-tribal-lands_n_1403046.html). (April 2012).
- [59] Thomas N. Smyth, John Etherton, and Michael L. Best. 2010. MOSES: Exploring New Ground in Media and Post-conflict Reconciliation. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '10)*. 1059–1068.
- [60] Olivia Solon. 2017. Ex-Facebook President Sean Parker: Site Made to Exploit Human 'Vulnerability' . *The Guardian*. (November 2017). <https://www.theguardian.com/technology/2017/nov/09/facebook-sean-parker-vulnerability-brain-psychology>
- [61] Dominic Spohr. 2017. Fake News and Ideological Polarization: Filter Bubbles and Selective Exposure on Social Media. *Business Information Review* 34, 3 (2017), 150–160. DOI:<http://dx.doi.org/10.1177/0266382117722446>
- [62] Bill Tomlinson, M. Six Silberman, Donald Patterson, Yue Pan, and Eli Blevis. 2012. Collapse Informatics: Augmenting the Sustainability & ICT4D Discourse in HCI. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. ACM, New York, NY, USA, 655–664. DOI: <http://dx.doi.org/10.1145/2207676.2207770>
- [63] Francesca Tripodi. 2018. Searching for Alternative Facts: Analyzing Scriptural Inference in Conservative News Practices. *Data and Society*. (May 2018). <https://datasociety.net/output/searching-for-alternative-facts/>
- [64] Julianne Tveten. 2016. On American Indian Reservations, Challenges Perpetuate the Digital Divide. <https://arstechnica.com/information-technology/2016/01/on-american-indian-reservations-challenges-perpetuate-the-digital-divide/>. (January 2016).
- [65] International Telecommunications Union. 2017. Measuring the Information Society Report. (2017). <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx>
- [66] M. Vigil, M. Rantanen, and E. Belding. 2015. A First Look at Tribal Web Traffic. In *Proceedings of the 24th International Conference on World Wide Web (WWW '15)*. Florence, Italy, 1155–1165.
- [67] S. Vosoughi1, D. Roy, and S. Aral. 2018. The Spread of True and False News Online . *Science* 359, 6380 (2018), 1146–1151. DOI: <http://dx.doi.org/10.1126/science.aap9559>
- [68] Vox. 2015. This is Cuba's Netflix, Hulu, and Spotify—All without the Internet. (2015). <https://www.youtube.com/watch?v=fTTno8D-b2E>
- [69] Fathul Wahid, Bjørn Furuholt, and Stein Kristiansen. 2006. Internet for Development? Patterns of Use Among Internet Café Customers in Indonesia. *Information Development* 22, 4 (2006), 278–291.
- [70] Nina Wakeford. 2003. The Embedding of Local Culture in Global Communication: Independent Internet Cafés in London. *New Media & Society* 5, 3 (2003), 379–399.
- [71] Robin Wilton. 2017. After Snowden – the evolving landscape of privacy and technology. In *Journal of Information (Communication and Ethics in Society)*, Vol. 15. <https://doi.org/10.1108/JICES-02-2017-0010>
- [72] Saskia Witteborn. 2014. Forced Migrants, Emotive Practice and Digital Heterotopia. *Crossings: Journal of Migration & Culture* 5, 1 (2014), 73–85.