The Expression of Power in ICT's Knowledge Enterprise: An Empirical Illustration of Computing's Colonial Impulse

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ABSTRACT

ICT globalization continues to spread hardware, software, and accompanying technologies, so too does knowledges and trainings on those ICTs. This knowledge migration process has been linked by scholars to a 'colonial impulse' inherent in computing as a knowledge enterprise, which incorporates into broader colonizing forces. Through simultaneous explorations of dual case studies with a tribal ISP in California and an educational organization that works with indigenous First Nations communities in British Columbia, we depict how power circulates in this process, both empower and disempowering communities. We then offer a brief argument for the need to foreground methods and approaches to disentangling these contradicting forces.

Author Keywords

Postcolonial theory; postcolonial computing; indigenous; infrastructure; education.

CCS Concepts

•**Social and professional topics** → **Cultural characteristics;** *Race and ethnicity; Informal education; Network operations;*

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INTRODUCTION

The process of information and communication technology (ICT) globalization brings western designed technologies across cultural borders, for example the 'One Laptop Per Child' (OLPC) project [28]. Intrinsic to the spread of the 'XO' laptops was the knowledge built into the machines: loaded with software and hardware built a world away from the contexts of their deployment, transmission of knowledge from centers of power to the periphery was necessary to repair these devices (which broke more often than predicted). Repair ecologies are an instance of such avenues of ICT knowledge migration, and are often the site of localized innovations [35, 14], especially when indigenous outlooks on design do not impact the priorities of designers in the developed world.

These examples point to the ways in which the computing knowledge enterprise [6] maintains itself through the spread of the accompanying knowledges, trainings, and techniques that support ICT globalization. Development efforts, primarily in information and communication technology for development (ICTD/ICT4D) and human-computer interaction for development (HICD/HCI4D) engage the knowledge migration aspects of the knowledge enterprise, so must contend with its complexities. Computing's knowledge enterprise expresses *power* with respect to the definition and migration of knowledge, which takes place across multiple avenues of development, motivating greater exploration of how it manifests in otherwise empowering initiatives. Dourish & Mainwaring [6] keenly point out the colonial impulse of the knowledge

enterprise [1], prioritizing examination of this process especially as it coincides with 'traditional' colonial practices.

We explore this multi-faceted expression of power by computing's knowledge enterprise (and its colonial implications) through a pair of case studies of projects firmly within ICT globalization, as well as with communities that navigate colonial realities: development of telecommunications infrastructure with an indigenous community in Southern California, USA, and a STEM educational program (within which ICT education is a component) in Vancouver, CA, servicing First Nations communities (among others) in British Columbia. We present relevant background, and then present the two cases briefly and lay out the context of computing's knowledge enterprise through empirical findings. We then close by analyzing expressions of power in these two domains, drawing parallel insights, and a conclusion.

BACKGROUND

Perpetual ICT access and use is increasingly becoming the norm as opposed to the exception of a privileged few. A valuing of access to digital resources has led scholars to examine the demographic dependencies of access [7, 13, 15], particularly those identified as oppressed or underprivileged, including indigenous peoples. Indigenous engagement with computing is largely considered to be empowering, evident in desires to cross the 'digital divide' as an avenue of self-determination [19, 20] and power [2].

As access has become more available, our understanding of the digital divide has moved beyond access to use, and a broader view of potential implications of ICTs as a tool for self-determination and empowerment. ICT has enabled explorations of social and new media as avenues of cultural expression [1, 3, 23, 34], language revitalization [9, 10], land and territory management through geo-spatial information systems [12, 21, 25], digital archiving [5, 33], and supporting sovereignty [26, 27].

Intrinsic to this movement is its bidirectionality: ICTs have impacts on culture, just as it they are a tool for self-determination and empowerment. Technological design has a status quo driven by influential social groups, described by philospher Andrew Feenberg as the "technical code" [8]. As technologies grow in use, so too does their impact, and the expression of their cultural origins. Awareness of ICT's cultural impact on indigenous communities has led to attempts to bridge the culture gap [30, 29].

With ongoing damage to cultural integrity a known consequence of colonization [18], the possibility of colonial expression in technologies, despite their ostensibly empowering value, collides with the reality of 'traditional' colonization. This is laid out by Dourish & Mainwaring [6], who identified the colonial narratives that exist within the assumptions of ubiquitous computing (ubicomp). Ubicomp is, in their words, part of the "knowledge enterprise": the institutions that promote a universal knowledge, quelling pluralities of thought. Furthermore, the institutional centers of computing knowledge control the narrative of ICTs more broadly, and so colonial narratives extend beyond ubicomp to ICT globalization more generally. This line of inquiry into computing is further developed by Philip, Irani, & Dourish [24], placing this discourse within the ICTD/ICT4D and HCI/HCI4D fields.

At the same time, what needs exploration is, given ICTs potential for negative impact, especially culturally, how the computing's knowledge enterprise expresses *power* in processes of globalization. Framing these expressions of power from the perspective of colonial assumptions synthesizes with colonial reality, a space which indigenous communities navigate daily. Exploring these expressions will contribute to postcolonial computing scholarship by furthering offering refinements of how scholars can also navigate this space and help ICTs realize their empowering potential.

DUAL CASE STUDIES

To explore the multi-faceted nature of power expression in computing's knowledge enterprise, we draw on two separate case studies performed by the primary investigatory (PI) and first author, in two separate national contexts. The first case study was conducted with a tribal internet service provider (ISP) in San Diego County, "Tribal Digital Village", and was IRB approved by the first author's home institution, as well as with permission from the organization itself. This ISP operates as a unit of the Southern California Tribal Chairmen's Association (SCTCA) in the outskirts of San Diego County, and provides broadband internet access to many of the reservations in the area. Owned and operated by the SCTCA, they operate independently of major telcos, many of whom have not made significant effort to provide internet access to reservation residents due to commercial challenges the rural context entails [31]. The case study itself focused on the organization's decision to reach the "hardest-to-reach" customers using television white spaces (TVWS) technology, a wireless broadband technology using this freshly opened chunk of wireless spectrum.

The other case study was conducted with a science, technology, engineering, and mathematics (STEM) educational outreach organization in Vancouver BC, the "Geering Up Engineering Outreach" program out of the University of British Columbia (UBC). Their educational outreach coverage involves over 20 indigenous First Nations communities throughout the province, and are seeking to indigenize their STEM educational offerings, as well as navigating the increased interest in IT education as a result of provincial educational priorities [32, 17]. In particular we focused on the organization's relationship with K'omoks First Nation, a small First Nations community (approximately 200 registered members as of 2016 [11]) on Vancouver Island with a standing relationship for educational outreach with Geering Up. This research received IRB approval from the PI's home institution, UBC, and K'omoks First Nation.

In both of these case studies, the PI first author spent time embedded with each (2 weeks in 2017 with the former, 2

[1] 'Colonial impulse' here speaks to the tendency for a knowledge enterprise to promote certain assumptions (i.e. universality or uneven distribution) that have a colonial orientation with regards to 'other' knowledges.

months in 2019 with the latter) building relationships, observing work practices, collecting documentation, and conducting interviews.

Synthesizing the Case Studies

While these are certainly distinct cases with regards to crucial contextual factors (these two communities represent distinct cultural contexts), the common thread of seeking avenues of empowerment in the face of colonization bridges this gap. Colonization is a shared experience, so synthesizing these two cases allows us to contextualize our findings to shared factors.

Reflexivity Statement

The PI's relevant background is as follows: the PI is a cisgender male and child of first-generation Filipino immigrants, born and raised in a rural town in Michigan, USA. The PI was raised with an awareness of the consequences of colonization and its ongoing impacts, given the history of the Philippines. This background along with time as a software engineer define the social and technical lens of this research.

THE CONTEXTS OF ICT'S KNOWLEDGE ENTERPRISE

Soft Political and Cultural Borders

The borders of indigenous communities in North America can be interpreted as 'soft': migration of resources, knowledge, people, and technologies are common enough to be less of a national border crossing and more of an entry into a town or city centre. These soft borders today are a direct consequence of the geo-politics of colonization in North America, covering any number of past and ongoing practices including forced relocation and explicit policies that limit the political autonomy of indigenous peoples. This has resulted in many shared norms, values, and technologies.

The reservations of the SCTCA and the K'omoks First Nation reserve are both examples of this. Closely situated to western culture has obfuscated the existence of formal barriers typical of national borders. English is the predominant language, formal schooling follows western models, and routine use of ICTs is the norm. TDV customers are regular ICT users, and K'omoks First Nation is a connected community. The influence of ICT adoption on day-to-day life is directly observable.

ICT Globalization and the Colonial Border

As an entity that exists to meet the demands of internet connectivity for their community, TDV's ICT infrastructure in the reservations of the SCTCA is rather unique: an ISP owned and operated within the reservations with indigenous leadership is in a place to challenge for local market share with much larger operators. While this allows them to explore technological solutions that better reflect their context (e.g. TVWS for their rugged terrain), adoption requires assistance. As an unfamiliar technology, TDV staff was frustrated incorporating TVWS devices into their network. Much of this frustration stemmed from the often unclear technical specifications and rationale behind FCC regulations of the TVWS spectrum. The opaque nature of external regulations crucially brought to the forefront the feeling of regulatory overreach. TDV had already an established set of norms and knowledges concerning the integration of their networking technologies with their operating context, and so additional regulation by external governing forces was perceived as a hindrance. To enable adoption, the TVWS vendor provided "hand-holding" for organizations around the globe, including TDV, from their location in Ottawa, Canada. In this way, sharing knowledge was integral to the localization of telecommunications technology.

In educational practices, this sharing is explicit. Increasing interest in ICTs as a livelihood has led to an increased interest in ICT education, which members of Geering Up's staff cited as influencing their decision to include more ICT education into their curricula. These educators reported increased interest from top-down forces via recent educational priorities of the BC provincial government (e.g. [32, 17]), and bottom-up from parents and school officials they work with, including those from indigenous communities. In these communities, students are growing up as digital natives, where daily life is inseparable from the apps and devices that mediate encounters with the world. Unsurprisingly, both Geering Up educators and indigenous community members connected ICT adoption to empowerment in education as promoting youth interest in engaging in what is perceived as a lucrative career. A community educator stated the hope that students would be able to "see themselves in their technologies," and connect with ICTs on a personal and cultural level, a phenomenon they connected to indigenous students consider technology as a career. Additionally, a common concern voiced by the educators was their own racial representation: there were simply very few indigenous members of their outreach team (only one at the time of the study). While the team had a desire for more representation, especially given their work, the current state was concern that they simply didn't look like the people in the communities they were trying to serve.

In both infrastructure development and education, the current state of concentration of computing knowledge empirically materializes, for instance in the challenges of technological localization or lack of racial and/or cultural representation. In this way, otherwise empowering initiatives are accompanied by forces stemming from computing's 'status quo'.

CIRCULATION OF POWER IN ICT'S KNOWLEDGE ENTERPRISE

Evident in both of these cases is that the practice of knowledge migration circulates power in both directions. TDV's existence and operations are driven by tribal/SCTCA ownership of the telecommunications infrastructure, a relatively unique circumstance that localizes development decisions to the community and away from large telecommunications operators. Community ownership enables decisions like the one to adopt TVWS, given its ostensible strengths in challenging environments. This suggests an agility in response to a situation that faces them, where the decision-makers are themselves members of the community.

On the other hand, necessary assistance by the TVWS vendor illustrates that power is likewise expressed through knowledge's uneven distribution, in tandem with otherwise empowering narratives, e.g. community ownership of infrastructure.

Simply, organizations like TDV need vendor support to expand their network through adoption. Simultaneously, regulations like those enforced by the FCC are explicit exercises of power [4, 16], mitigating the freedom of organizations like TDV to control and deploy their technologies in line with their community context. What is 'legal' has been defined outside of the community (and therefore decontextualized), and enforced by external institutions.

In the case of Geering Up, providing a sense of opportunity to pursue a career in ICTs is an explicitly empowering notion echoed by educators, administrators, and indigenous community members alike. However, the current centering of the computing knowledge enterprise presents itself in the form of limited examples and limited awareness of indigenous produced ICTs, especially by those students who will go on to be the next generation of builders. This parallels the racial representation of educators, where limited representation leads to limited awareness of indigenous students' own potential. Thus, students who could become developers must look to non-indigenous cultural centers for inspiration, obscuring their ability to "see themselves in their technologies."

Empowerment and Disempowerment are Entangled

Using aspects of Dourish & Mainwaring's [6] colonial narratives as an analytic framework of sorts can help scholars critically view assumptions that undergird ICT globalization, especially in contexts where technology is described as diffusing from developed to developing contexts. Assumptions of uneven distribution of knowledge manifest literally as knowledge migrates, driven by interests on both sides. Assumptions of universality likewise manifest through broad regulations that may or may not synthesize with a local context, or the ICT ecosystem's means of implicitly quelling epistemological plurality through maintaining a racial and technological 'status quo', what Feenberg describes as the "technical code" [8].

However, the practice of knowledge migration in ICT globalization (and knowledge migration more generally) obscures these underlying colonial assumptions and their inherently disempowering nature, as they are entangled with themes of empowerment: encounters with those in both case studies who live daily with colonial realities reveal them to be much more engaged with what computing (and more broadly STEM) offers them and their communities. In these cases, it could be broadband internet access for their community, or opportunities for a lucrative livelihood. Simultaneously, computing's knowledge enterprise exercises a form of control over these processes. We observe that, for organizations like TDV, power is expressed through external regulation and dependence on external institutions (like the vendor) to adopt and adapt novel technologies. We also observe that for Geering Up's communities, power is expressed through the current lack of representation in technologies and educators alike, threatening to maintain a 'status quo' over the shape and form of digital technologies. In this sense, educational practices are both explicitly empowering in knowledges they bring, but the process has disempowering obstacles to overcome.

What we believe this to be indicative of is that the current state of the computing's knowledge enterprise *entangles* empowerment and disempowerment. Critical theorists have long known about the simultaneous oppressive and emancipatory potential of ICTs [36]. They are, in essence, two sides of the same coin of ICT globalization.

Escaping Computing's Colonial Impulse

This fact becomes even more significant when disempowerment is placed within the discourse of colonialism, given indigenous communities' constant ongoing battle against colonization. Indigenous communities in North America are locked in a daily struggle to maintain agency over their community's cultural integrity [18], so in situations where tools for empowerment (like ICTs) can nonetheless become avenues of control, disentangling empowerment and disempowerment becomes essential.

Perhaps central to conceptualizing colonialism as a knowledge enterprise in the way that Dourish & Mainwaring [6] do is the a theme of *centrality* of power in ICT: knowledge migrates from "centers of power," what is being assumed universal still has its origins in these centers, and processes of migration are conceptualized by a center-periphery divide. In this sense, colonial narratives depend crucially on this centrality achieving hegemonic status.

By corollary, unseating centrality suggests a re-rendering of computing as a pluralistic epistemological endeavor, challenging the centrality of power that is foundational in the knowledge enterprise. The development of the concept of 'epistemic delinking' by decoloniality scholars like Walter Mignolo [22] provides a theoretical basis for this movement by proposing a transition from epistemic universality to epistemic plurality. Within computing, to unseat the centrality of power at the heart of the knowledge enterprise necessitates a radical rethinking of just what computing means: its shapes, its forms, and how different epistemological perspectives can create it. This rethinking must in turn occur in the hands of those communities and nations that are not within the "center" of computing's purported epistemic point of origin, but rather what could be considered its periphery, and are also engaging computing's potential in light of their own cultural, social, and personal foundations.

That being said, smaller communities with their own distinct cultural outlook face an uphill battle to disentangle empowerment from disempowerment. For instance, K'omoks First Nation consists of only around 200 registered members [11] which severely hinders most forms of native ICT development: there are few ICT trained professionals, potentially insufficient financial resources to support such initiatives, as well as limited market interest in anything built for a particular community like K'omoks would largely be confined to just that and only that community.

Thus, while it remains unclear just what a decentralizing of ICT's knowledge enterprise would look like in reality, what I argue for nonetheless is that scholars working in postcolonial and decolonizing computing must foreground the question of disentanglement in analyses of ICT globalization's impact on people and societies. In fact, I argue that disentanglement should serve as the ultimate end-goal of computing as em-

powerment, and that, in turn, development projects should prioritize whether their initiatives truly move in the direction of epistemological delinking in computing.

CONCLUSION

Drawing on two distinct case studies working with organizations and communities that navigate colonial spaces, we drew insights into how power is expressed through computing's knowledge enterprise. Examination of the process of knowledge migration reveals it to be a circulating phenomenon, where the expression of power both serves and pushes against indigenous communities' potential to define the ICT narratives within their communities. We used this discussion to argue for a disentaglement of these conflicting forces through epistemic delinking of computing, but likewise acknowledge the pragmatic issues that need to be surmounted to realize computing's empowering potential. This perspective ought to be foregrounded during any ostensibly empowering computing initiative (such as ICTD/ICT4D and HCID/HCI4D), especially when those communities already contend with the daily consequences of 'traditional' colonialism as well as computing's colonial impulse.

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