Article

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Using Digital Technologies for Indigenous Sociocultural Advancement in an Era of AI: A Systematic Critical Synthesis

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Abstract: Indigenous cultural resurgence parallels generative AI emergence. This article synthesizes digital technology projects for Indigenous sociocultural advancement. It analyzes 69 studies in five continents through a bifocal critical apparatus. The first lens uses activity theory to explore project ecologies comprised of peoples, objectives, places, technologies, and tensions. The second lens reveals ideopolitical framing patterns as studies are strategically positioned at the interface of Euro-Western and Indigenous cultures. Eight project types, developed by and for Indigenous peoples, are identified. Although consumer technologies predominate, many complex IT assemblages are attested. However, technological complexity often requires "outsider" experts, which limits local control over processes, data, and outcomes. The sampled studies highlight three ideopolitical frames: cultural bridging, countering Euro-Western dominance, and technical problem-solving. The foregrounded political themes are digital empowerment, data sovereignty, identity expression, and online activism. This study critically organizes underexplored research and charts new pathways for exploring digital technologies, culture, and Indigeneity.

Keywords: digital technology; cultural resurgence; indigenous; sociocultural advancement; cultural digitization

1 Introduction

In recent decades, Indigenous peoples have pursued cultural reclamation through grassroots activism, engagements with the United Nations, and legal action in settler-dominated nations (United Nations 2023). These efforts have occurred alongside the proliferation of Euro-Western information and communication technologies (ICT) which are increasingly incorporating algorithms showing signs of general intelligence (Bubeck et al. 2023). Academics in several domains are bridging these developments by instigating and investigating strategic uses of ICT and artificial intelligence (AI) to support Indigenous sociocultural resurgence.

The contexts of this research are diverse and strewn with logistical and political challenges. The United Nations (2023) estimates the global population of Indigenous peoples to exceed 370 million, representing over 5,000 distinct cultures in every continent except Antarctica, and comprising 5 % of the world's population. However, this convenient statistical reduction only begins to capture the full spectrum of Indigenous experience. Indigenous peoples may live in remote communities or thrive as members of urban diasporas. Their diverse lifestyles, values, and material cultures plot on trajectories that predate or coincide with Euro-Western migration, settlement, and colonization. Some Indigenous groups express concern about the encroachment of "outsider" technologies and the erosion of traditional cultural practices (Bala and Tan 2021; Rosa 2022). Other groups enthusiastically deploy high-tech systems to meet social, informational, and governance objectives (Métis Nation of Ontario 2021). Some Indigenous peoples even express openness to "kinship relations" with non-human entities (Morford and Ansloos 2021), which aligns with emerging forms of human-machine symbiosis (Gladden 2019). Although Indigenous collectives tend to comprise non-dominant populations within settler states (Daes 2008), Indigenous individuals often thrive as social media influencers, IT specialists, and cyber activists (Carlson and Frazer 2021).

During a twenty-month fellowship at a Canadian university, the first author advanced a transnational program of technology research (Blayone 2019; Blayone et al. 2020; Blayone et al. 2018; Blayone and Van Oostveen 2020; Mykhailenko et al. 2020) through technical experimentation and interdisciplinary reading, including human-machineelations, Indigenous studies, generative AI and cultural analysis. One notable thematic cluster within a research database

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addressed uses of digital technologies for Indigenous sociocultural advancement. This cluster offered a conceptual link between Indigenous resurgence and the emergence of human-level machine intelligence (Goertzel 2007), offering fertile ground for synthesis.

The authors began by reviewing extensive research notes in an Obsidian knowledge base and formulating exploratory questions to construct a robust theoretical perspective:

- What are the Indigenous cultural advancement foci of published projects?
- What peoples, places, and digital technologies are involved?
- What are the identities and cultural commitments of the actors?
- What digital technologies and machine intelligence are deployed?
- What challenges arise when academic researchers, IT specialists, and Indigenous community representatives collaborate?
- How do researchers relate their studies to Indigenous ways of being and knowing?
- What political issues emerge in the digitization of Indigenous culture?
- Do academic interventions yield measurable benefits for Indigenous peoples, and are these recognized by the intended beneficiaries?

These questions spanned technological, sociocultural, and ideopolitical concerns, underscoring the need for a transdisciplinary approach. The authors recognized that Indigenous-engaged projects operate at a fragile interface between dominant Western sociocultural systems and historically suppressed worldviews. Thus, mapping the "state of knowledge" required more than organizing goals, methods, and outcomes – it also demanded critical interrogation of systemic tensions, the subtle politics of cultural digitization, and the discursive strategies shaping project reporting.

Consistent with this research agenda, Section 2 defines our multi-perspectival conceptual lens delineating the inquiry and structuring the formal research questions (RQs) in Section 3. Section 4 presents a precise methodological statement grounded in systematic review repertoires. Section 5 organizes findings sequentially by RQ, integrating visualizations for clarity. Finally, Section 6 discusses novel insights, acknowledges limitations, and outlines directions for future research.

2 Conceptual Lens

A bifocal conceptual lens, as visualized in Figure 1, was constructed to formulate research questions and guide a historical activity theory (Kaptelinin and Nardi 2012) to analyze ecological and operational characteristics of techno-cultural projects by and for Indigenous peoples, and (b) framing theory (Chong and Druckman 2007) to organize ideopolitical patterns in the academic reporting of these projects. With sensitivity to social, technical, and political dynamics of cross-cultural interaction and research reporting, this apparatus lends itself to orchestrating a holistic critical synthesis of the sampled literature.

2.1 Cultural Historical Activity Theory

Cultural-historical activity theory (CHAT) originates from an early Soviet research program exploring a human subject (S), mediating means (M) (e.g., physical artifacts and cognitive "tools"), and a motivating object (O) (Vygotsky 1978). The primary goal was to investigate the psychological processes by which human cognitive schemata are (re)structured by techno-cultural mediation. The concept of "activity" was introduced as a minimal context for analyzing S-M-O scenarios (Leontiev 2005).

Subsequently, Western scholars developed CHAT in two synergistic directions. One direction, rooted in human-computer interaction (HCI) research, focused on individual subjects engaged in technology-mediated activities (Kaptelinin and Nardi 2012). This perspective emphasized human agency and effective IT mediation as critical factors in achieving one's goals. The other direction, rooted in the developmental work research of Yrjö Engeström (2000), expanded the social context of activity. Engeström's activity system incorporated situated ensembles of humans and mediating technologies in goal-driven assemblages that produce outcomes and *tensions*.

Three directing insights are distilled from this research tradition, which is elaborated in detail elsewhere (Blayone 2019; Kaptelinin and Nardi 2012). These insights align with key themes in Indigenous studies research and are used to formulate the first two of four RQs.

(1) Orchestrated systems: Activities are conducted within orchestrated ecologies of human entities, mediating technologies, processual repertoires, and relational dynamics, forming socially bounded systems. These systems are driven by objectives (including intentions, purposes, and strategies) and mediated by operational dynamics and cultural protocols. Viewing activities as contextually rooted ecosystems aligns with Indigenous place-based epistemologies (de Mori 2016).
(2) Control dynamics: Entities in activity systems express agency – the ability to act towards a goal (Kaptelinin and Nardi 2012). Human agency contributes to a sense

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