

Cultural use of ICT4D to promote Indigenous knowledge continuity of Ngarrindjeri stories and communal practices

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Abstract

While there is a considerable amount of interest in information and communication technologies for development (ICT4D) in the Indigenous communities, it remains limited to those who can afford it and have the skills and knowledge to implement the technology and access appropriate digital tools. Hence, Indigenous communities are continually stigmatized as marginalized, leading to a cultural misrepresentation of histories that affects the continuing information disparity between Indigenous and Western knowledge systems, particularly the insufficient technology infrastructure designed for traditional users. In this article, ICT4D was conceptualized as a digital platform to support Senior Ngarrindjeri Elder Aunty Ellen Trevorrow in continuing her practice of weaving and storytelling throughout the pandemic. In this context, the community-based participatory research (CBPR) principles within the structure of video ethnography were qualitatively designed to implement the ICT4D project culturally and ethically. Video recordings, image data, transcriptions, and the Ngarrindjeri ICT4D Pondi (Murray Cod) framework were embedded to justify the findings and the aim of illustrating Aunty Ellen's knowledge-sharing process to online learners. Likewise, the results demonstrate the positive and negative impact of COVID-19 on the continuity and orality of Aunty Ellen's cultural stories and practices. The future continuity of Aunty Ellen's knowledge ought to consider the inconsistency of technological infrastructure in regional areas, her waning health, and the interconnectedness of oral expertise, which often pose challenges. This study is a small step toward a better understanding of the value of oral knowledge; emphasizing the creation of e-learning weaving instructional videos is valuable for future digital management of Indigenous knowledge relevant to LIS.

1 | INTRODUCTION: CULTURAL CONTEXT

The historical marginalization of Indigenous people remains widely documented and woven into Aboriginal

colonial history and is still relevant today (Burnette & Figley, 2016; Haines, 2021; Reveley & Down, 2009; Salmon et al., 2010; Sánchez, 2018; Shahjahan, 2005). Hence, Indigenous communities are continually stigmatized as marginalized, leading to a cultural misrepresentation of histories

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that influences the continuing information disparity between Indigenous and Western knowledge systems, particularly the insufficient technology infrastructure designed for traditional users (Sánchez, 2018). The generational impact of colonialism on traditional knowledge will remain an obstacle unless issues are addressed at the grassroots level. To address the impediments, a shared dialogue is needed, and respect, trust and knowledge transparency must be established before the research begins (Haines, 2021).

This article shares two projects employed as a collaboration initiative (1) “*Virtual Ngarrindjeri Weaving Workshop*” with 3Ai Institute of Australian National University (ANU) and (2) “*Yarning Online On Country*” with Indigenous Elders from Bourke, New South Wales, Australia (see Appendices A and B). These two projects were implemented during the strict South Australian lockdown and border closure of the first wave of COVID-19 that affected the economic livelihood of traditional face-to-face storytelling, cultural practices, and events. Importantly, this article aims to explore the role of the ICT4D and focuses on the following discourse:

1. To provide insights into the cultural use of ICT as a digital platform to implement the Ngarrindjeri ICT4D project while helping Senior Ngarrindjeri Elder Aunty Ellen Trevorrow to continue her practice of weaving and storytelling throughout the pandemic.
2. The video ethnographic application of community-based participatory research (CBPR hereafter) principles arguably provides a reliable foundation to implement ICT4D culturally and ethically. Other researchers also highlighted that CBPR implies reciprocated trust, respect, and mutual research relationships as a basis of informed consent (Barbareschi et al., 2020; Dutta, 2021; Lorini et al., 2018; Mac'Ouma, 2018; Pink, 2013; Rigney, 1999; Sabiescu, 2010).

The words “Aunty” and “Elder” or traditional user in this study are terms that are collectively used to show respect for the status of Elders in the community (Haines et al., 2017, p. 3). In this instance, Aunty Ellen's contribution is crucial to maintaining the integrity and authenticity of the visual recordings. The framework (Figure 1), video recording (Figure 3), and transcription extract were collectively to justify the findings and illustrate Aunty Ellen's behavior in the knowledge-sharing process for online learners. This article was based on Aunty Ellen's views, values, beliefs, and practices. Therefore, it does not represent the views and approaches of the rest of the population in the Ngarrindjeri Nation. Herein, ICT4D is used to showcase Aunty Ellen's technological adaptability, which contributed to

the successful implementation of the two projects' fundamental knowledge of our proposed framework. This article concludes with the “*Ngarrindjeri ICT4D Pondi (Murray Cod) framework*” designed for the future continuity of Aunty Ellen's knowledge considering the unpredictability of technological connectivity in regional areas; her waning health, and the challenges of sharing oral wisdom. The framework will provide valuable information to refine future research on Ngarrindjeri ICT4D projects.

1.1 | Cultural use of ICT4D in Ngarrindjeri context

While there is a considerable amount of interest in information and communication technologies for development (ICT4D) usage in the Indigenous communities, it remains limited to those who can afford it and have the skills and knowledge to implement the technology and digital tools. Research broadly defined ICT4D as an information and communication technology project and program for community development (Hoque & Ashraf, 2015; Sein et al., 2019). ICT4D projects aim for technological development and economic wellbeing directed in marginalized and developing countries; however, it is an unfamiliar term for traditional users (Cheney, 2019; Marais & Vannini, 2021). Not surprisingly, when it came to ICT4D implementation in traditional land, scholars faced an uncertain outcome and were unsure about appropriate methodologies to address the underlying challenges involving traditional users (Diniz et al., 2014; Du & Haines, 2017; Haines, 2021; Hayes & Westrup, 2012). In this context, the article aims to adapt the strategies, cultural protocols and ethical guidelines used in Haines (2021) and the mutual relationship built over 20 years with the same community and collectively conceptualize the following questions:

- RQ 1: How is ICT4D being used in applying the community-based participatory research principles within the structure of video ethnography to implement the projects' *Virtual Ngarrindjeri Weaving Workshop* and “*Yarning Online On Country*”?
- RQ 2: Can the Ngarrindjeri ICT4D visual design framework provide sufficient information to support future technological community projects to maintain the continuity of oral knowledge?

During the first wave of COVID-19, South Australia imposed strict social distancing measures, and the borders were closed for interstate and international travel. Upon the announcement, the local Aboriginal

communities closed its gate to visitors and tourists to prevent the spread of the virus to the community. The closure affected the local art trades and face-to-face cultural activities and events. So, to lessen the economic impact of the pandemic on the community's cultural practices, Aunty Ellen Trevorrow had to learn quickly and understand the possibility of using the ICT platform to continue her weaving and storytelling practices for online learners. The opportunities arose when Professor Diane Bell from 3Ai Institute, Australian National University, proposed the idea of a *Virtual Ngarrindjeri Weaving Workshop*, and right after, we received another project proposal through “*Yarning Online On Country*” with Indigenous Elders and Lorina Barker, Indigenous Lecturer at the University of New England from Bourke, New South Wales (see Appendix A). Mutually, the projects were implemented using the video conferencing Zoom app to connect with participants, which is why this project was framed under the ICT4D structure. Besides, under the arrangement of ICT4D, it emphasizes a shared initiative developed and implemented by collaborators to create an e-learning weaving instructional video using Aunty Ellen's 40 years of weaving expertise and storytelling.

Similarly, combining ethical approaches and protocols to implement the two projects using the community-based participatory research grounded in video ethnography generated new cross-community knowledge sharing through mutual learning. The main obstacle to implementing the projects successfully is the unreliability of internet connection in regional communities. Another problem is that although we have the full support of Aunty Ellen, applying the outcome from this project to future Ngarrindjeri ICT4D initiatives might take time as Ngarrindjeri knowledge is diverse and sometimes presents methodological and theoretical challenges in adapting the ICT4D concept, primarily when traditional users are disinclined to engage in the process without proper community consultation (Haines, 2021; Kelly, 2020).

2 | USE OF COMMUNITY-BASED PARTICIPATORY RESEARCH WITHIN THE STRUCTURE OF VIDEO ETHNOGRAPHY IN CONJUNCTION WITH ICT4D

RQ 1: How is ICT4D being used in applying the community-based participatory research principles within the structure of video ethnography to implement the projects “*Virtual Ngarrindjeri Weaving Workshop*” and “*Yarning Online On Country*”?

Community-based participatory research has been credited to the works of Kurt Lewin, a social scientist

who developed the CBPR principles for social change in the 1940s (Holcup et al., 2004, p. 2). The works of Paulo Freire further expanded Lewin's participatory method. Freire's work was instrumental in bringing cultural literacy to “the urban and rural poor in northeast Brazil” (Blumenthal, 2011; Wallerstein et al., 2017). Freire believed that a dialogic and mutual relationship in working with marginalized communities is a better strategy to create equal opportunities and build long-term reciprocal relationships. Fundamental to Freire's works are aimed at practical learning, which echoes Ngarrindjeri ways of knowing and practices (Haines, 2021; Madron & Jopling, 2003). Madron and Jopling (2003) noted that co-learning is vital for dismantling research inequalities and quote:

Freire took education out of the classroom and created “the culture circle,” where learners used their speaking methods to articulate their shared understanding of how their world came to be like and how to act to change their future. A core component of Freirian theory is that learning begins with action and is then shaped by reflection, leading to further action. Learning is, thus, a continuous process directed at enhancing the learners' [marginalized community] capacity to act in the world and change it. For Freire, whether it is called literacy or learning, this is the principal political task of any society committed to people power (Madron & Jopling, 2003, p. 1).

Given the cultural sensitivity of oral stories and communal practices, the use of the community-based participatory research (CBPR) principles within the structure of video ethnography for this study is needed to echo Freirean theories of continuous learning, which paralleled Aunty Ellen's ways of passing her stories and knowledge of weaving (Figure 3).

Moreover, the underlying principles of CBPR are to provide a shared space for collaboration and to recognize existing knowledge (Pidgeon & Cox, 2002). For instance, Aunty Ellen's significant contribution as an ICT4D and co-author in the conception of this article, without her support, the possibility of jeopardizing the dissemination and connection of oral stories and the embedded sacredness to the cultural process of weaving (Israel et al., 1998; LaVeaux & Christopher, 2009). Jacques et al. (2013) added that using community-based participatory research to address issues in marginalized communities effectively removes the inequality of power from the research process (Du et al., 2020). LaVeaux and Christopher (2009) suggested that community-based participatory research creates a space

TABLE 1 Community-based participatory research key principles

CBPR elements	CBPR description in conjunction with ICT4D
1. Using CBPR principles within a cultural context	Building trust and mutual relationships using CBPR principles within a cultural context
2. Acknowledge community's strength and cultural diversity through history, arts, and culture	Recognizing existing knowledge, resources, key knowledge holders, key organization appropriate for the given project, and committed Elders who will represent to ensure that the community voice is included in the ICT4D process
3. Identify local priorities and community concerns	Matters relevant to the community share benefits back to the community, and the community raises questions
4. Design and conduct theoretical policy research accordingly	Use appropriate methods, design, data collection tools suitable to the topic and strategies to implement culturally significant research outcomes. Also, time must be factored into the design methodology
5. Interpreting the findings within a cultural context	Sharing feedback with the community is crucial; data analysis outcomes transcribed written stories, images, audio recordings, and clear information to the storytellers involved in the study
6. Disseminating and translating findings culturally	Equal access to findings is necessary, ensuring appropriate ways to share the findings, the role of the community in publishing the results, and how the results will be translated and communicated ethically
7. Maintain, sustain, and evaluate partnership	ICT4D involves a continuing process, accountability, and continuity of traditional knowledge beyond the research structure

for storytellers to contribute, and “to use Indigenous ways of knowing in interpreting data within a cultural context” is crucial to close the gaps and inequalities in LIS research (see Appendix B). Wallerstein et al. (2005) added that a genuine adaptation to CBPR principles brings a change to the Indigenous community by recognizing existing knowledge as a “fluid,” “dynamic,” at times “fast-paced” and “slow,” require “long-term commitment” and sharing the findings without biases (p. 32). In this project, CBPR is further used for long-term relationships and viewing the issues through the community's lens, providing a deeper understanding, mutual benefits of local concerns and co-learning (Table 1). Note that the procedural process of CBPR is focused more on iterative development and nonlinear approaches, emphasizing knowledge transparency, reciprocity, and co-learning, as conveyed in Tables 1 and 2.

Table 1 stipulates the seven existing elements of CBPR that Barbara Israel and colleagues identified (Israel et al., 2013) and that the first author's doctoral research was culturally extended (Haines, 2021). Applying the CBPR principles in conjunction with ICT4D may be more time-consuming than conventional research approaches, and the partnership-building process may take months or years to develop. Nevertheless, the process dramatically influences the community and future research involving Indigenous people. Also, using the CBPR principles can negate community negotiations when it comes to unforeseen cultural proceedings, such as ceremonies, cultural events, and the passing of some community members. Furthermore, understanding CBPR must pay attention to

the context-dependent characteristics of traditional people's oral knowledge, particularly applying the principles to other projects and communities, which needs to build on trust, respect, and reciprocity within a specific cultural context (Holkup et al., 2004; Mikesell et al., 2013).

To some extent, it is a challenging and laborious process that needs implacable patience and persistence, and yet it is rewarding, especially when the community is involved and satisfied. One major challenge in CBPR is safeguarding the anonymity of a person's identity and ensuring that oral stories are protected with appropriate policies and protocols for future digitization and knowledge prosperity. For this matter, the active involvement of traditional people in ICT4D projects is crucial because it provides a sense of belonging and ownership to their stories. When the community is actively involved in ICT4D, it minimizes the imbalances in research, focuses on knowledge advocacy, and evades the misappropriation of oral knowledge.

Tables 1 and 2 imply CBPR principles essential to the ethical implementation of ICT4D, providing a guiding role for research sustainability and feasibility of the project without compromising the outcomes. Likewise, Tables 1 and 2 are tenets that emphasize knowledge transparency, legitimacy, and appropriate methodologies to preserve recorded stories (Horowitz et al., 2009).

In this case, the suitability of video ethnography (VE hereafter) creates a procedural bridge between CBPR and ICT4D and helps develop culturally appropriate methodologies that facilitate shared outcomes that benefit the community and fundamentally recognize that

TABLE 2 Nine CBPR principles described by LaVeaux and Christopher (2009)

Community-based participatory research principles relevant to the Ngarrindjeri context	
CBPR in Ngarrindjeri context	Key principles for executing the Ngarrindjeri ICT4D projects
1. Recognize key knowledge keepers	Elders in the community are storytellers, knowledge keepers, mentors and traditionalists who influence others while maintaining shared communication
2. Recognize ethic sovereignty	Protecting storytellers' interests and ensuring cultural appropriateness and adherence to cultural protocols and customary laws are respected
3. Recognize cultural diversity	Recognize the locality of knowledge diversity and preservation strategies and policies to protect the authenticity and integrity of traditional wisdom
4. Understand ethnic practices	Formulate research projects and questions relevant to the community, providing significant impact directed back to the community
5. Recognize the past histories of research conducted in traditional land	Decades of research exploitation have left many traditional people hesitant to participate in academic research. CBPR and ICT4D help in achieving an equitable approach to engaging traditional storytellers as co-learners and ensure that cultural appropriateness of protocols and locality of laws are put in place before the research begins
6. Use Ngarrindjeri ways of thinking	Understand the importance of cultural ceremonies, events, and activities; these considerations must apply to all project phases, that is, planning, development, implementation, data gathering, analysis, dissemination of findings, and project evaluation
7. Interpret data within a cultural context	All stories gathered during research must be analyzed within a cultural context, free from misappropriation and manipulation of content, maintaining the authenticity and integrity of oral wisdom
8. Plan for extended project timelines	Projects conducted on traditional land need to aim for long-term outcomes and knowledge support for the community involved
9. Leadership turnover	Co-design leadership turnover involves knowledge mentoring and the continuity of research beyond the academic structure

community members like Aunty Ellen Trevorrow are the experts of their knowledge. So, contextualizing CBPR in conjunction with VE and ICT4D within the traditional context allows a shared space for dialogic and contributes to the ethical execution of the “*Virtual Ngarrindjeri Weaving Workshop*” and “*Yarning on Online On Country*” projects which are encapsulated as Ngarrindjeri ICT4D to convey the project focus.

2.1 | Methodologically weaving the design elements of CBPR and video ethnography to implement the Ngarrindjeri ICT4D project

RQ 2: Can the Ngarrindjeri ICT4D visual design framework provide sufficient information to support future technological community projects to maintain the continuity of oral knowledge?

This section imparts the strategies and methodologies to develop the Ngarrindjeri ICT4D project; the name was culturally framed in response to the two projects in consultation with Aunty Ellen, creating a familiarity of the project that correlates with the locality. The impact of the

Ngarrindjeri ICT4D project was assessed on community needs, feasibility, technical and mobile device support and desirability of the initiative and implications for future Ngarrindjeri ICT4D research. The success of the two projects was significantly attributed to Aunty Ellen's commitment and ability to adapt and learn ICT quickly.

A monthly ICT training was scheduled before the Ngarrindjeri ICT4D project was implemented. The virtual ICT training was conducted at the early stage of the first waves of the COVID-19 pandemic in 2020 (see Appendix A). The preliminary ICT training was focused on the technicality of navigating the Zoom interface and familiarizing myself with the mobile devices (Figure 2). The ICT training took eight full-day sessions and was stretched over 4 months. The training went efficiently, considering the first author's prior knowledge and technical savvy of using digital mobile devices and navigating online confidently. ANU university provided most of the digital technology training and supplied the equipment (Tablet 1) needed to implement the “*Virtual Ngarrindjeri Weaving*” workshop to post-graduate engineering students at 3Ai Institute. However, using one tablet and one computer was a big challenge and proved difficult for Aunty Ellen. She could not see the students' faces and frequent movements of her hands while telling stories

(Figure 3). So, the first author used her salary from ANU to buy a new laptop that could process the Zoom interface faster (Figure 2). We faced another challenge; the regional location of Camp Coorong had proven to be an obstacle; weather changes affected the Internet connection, leading to frequent dropouts. ICT knowledge gained from ANU was instrumental in implementing the second project, “Yarning on Online On Country,” to the UNE University and Indigenous Elders from Bourke, New South Wales. As the Ngarrindjeri ICT4D progressed, Aunty Ellen and the first author recorded the Ngarrindjeri weaving process and shared it with the UNE as contingencies concerning continuing Internet connectivity. The “Ngarrindjeri e-learning weaving instructional video” recording was an instrumental source of educational material to solve the concerns of Internet connection dropouts (Figure 3).

The video recording provided another idea for the theoretical conception of a framework to visually combine theory, practice, and Aunty Ellen’s cultural beliefs and tradition (Figure 1).

2.1.1 | Creation of the Ngarrindjeri ICT4D Pondi (Murray Cod) visual design framework

In this context, traditional users respond very well to visual connection, cultural relations, totems, and the land. So, in honor of Aunty Ellen’s continuing

contribution to academic research as a cultural mentor, co-researcher and author, the creation of “Ngarrindjeri ICT4D Pondi (Murray Cod) visual design framework” was derived as a stylized design of her Ngartji (totem) Pondi (Murray Cod), as shown in Figure 1.

The “Ngarrindjeri ICT4D Pondi (Murray Cod) visual design framework” is influenced by the weaving sculpture that Aunty Ellen and the first author collaborated with the South Australian Maritime Museum. These projects visually preserved Aunty Ellen’s knowledge of weaving and storytelling, a valuable resource for future research and preservation management of oral knowledge. For instance, the “Ngarrindjeri e-learning weaving instructional video” combined with the framework is a significant source of information for the continuity of Ngarrindjeri stories and embedded wisdom during activities. Furthermore, the *framework* can be used as a stand-alone poster without the lengthy written text attached, which is often the source of disinterest of knowledge users. The framework summarizes information as visual guidelines used in this project and the possibility of extending its purpose for future ICT4D in the Ngarrindjeri land. A vital component of the framework is integrating the connection and importance to Aunty Ellen’s totem—the Pondi (Murray Cod). The framework design concept is created by categorizing the process and writing for future application of Ngarrindjeri ICT4D, divided into three scalable goals expressed in acronyms as *Continuity, Technology, and Implementation* (CTI), dividing the ICT4D

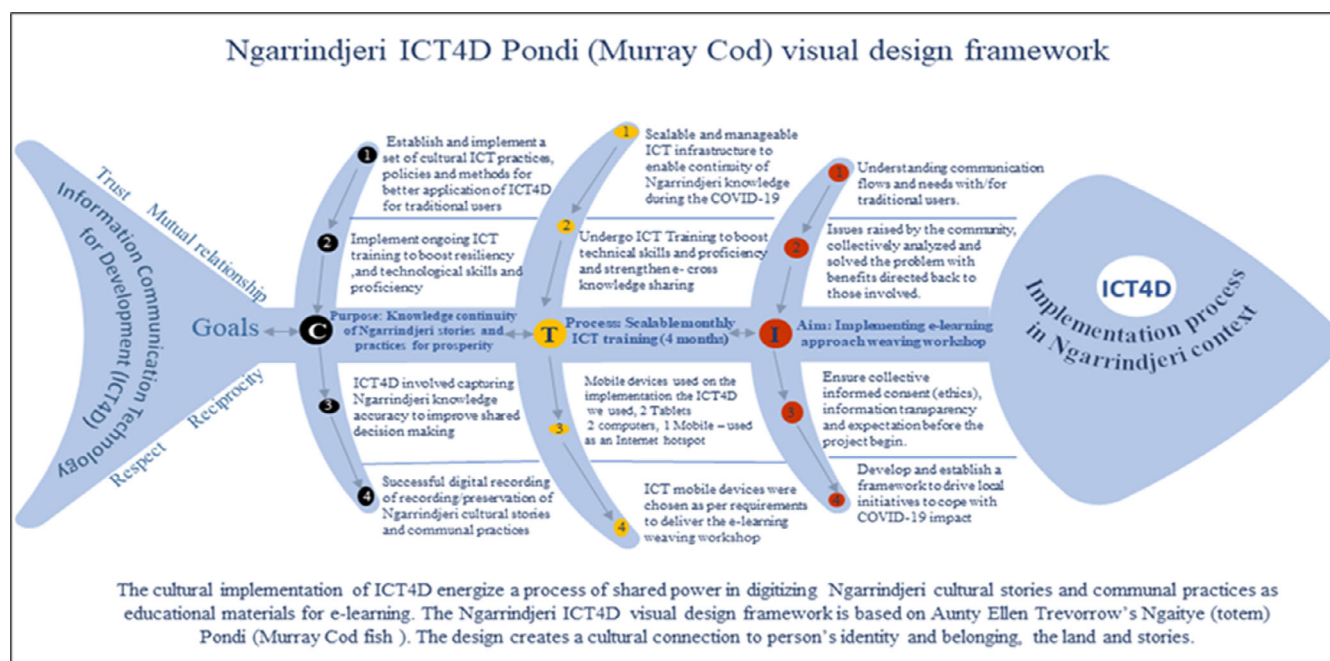


FIGURE 1 Ngarrindjeri ICT4D Pondi (Murray Cod) visual design framework, linked to digital file: https://drive.google.com/file/d/12c1UPbwXIZSICL6tI0cA_fTXeDgzW0F9/view?usp=sharing

process into manageable objectives of synthesizing and disseminating oral knowledge adheres to cultural protocols and ethical research. In addition, the framework is designed with centrality and adherence to the ethical belief of conveying oral knowledge as a “living document,” which can remain under constant review allowing space to adjust as technologies evolve and new ethical challenges materialize (Dearden & Kleine, 2019, p. 3).

2.2 | Data collection design process of implementing ICT4D in the Ngarrindjeri context

The data collection design process of implementing ICT4D in the Ngarrindjeri context was involved in situating the locality of the research. In this case, Camp Coorong is located 10 km from the town of Meningie on the southeast side of Lake Albert in South Australia and is home to 113 Indigenous community members. Camp Coorong is next to the South Australia Coorong National Park. The center was founded in 1985, fully established in 1987 and is managed locally by the Aboriginal organization. The center is geographically placed where knowledge is

exchanged and a place where issues are raised between government agencies, funding bodies and researchers.

Although one Senior Elder participated in this research, her active involvement in Ngarrindjeri cultural programs and her tenacity to continue sharing her knowledge and stories during the pandemic were commendable. The visual pieces of information were taken during a face-to-face video dialogue session with Aunty Ellen Trevorrow. The interview was purposely recorded for the e-learning weaving workshop held during the COVID-19 lockdowns. The duration of video segments varied accordingly and was carefully selected for this article and formed as part of the outcomes expressed in the findings. The extent of the recorded video reflects the cultural significance of stories relevant to Ngarrindjeri culture and tradition (Figure 3). The inclusion of images, transcripts [transcribed as express] and Aunty Ellen's voice presented in video segments is crucial to maintain the integrity and authenticity of oral knowledge. For this matter, the video segments were edited using the Filmora software. The still images were taken using the Android Pixel 4 mobile phone device and the videos were recorded using the Canon EOS 700D camera. Aunty Ellen's active involvement as a storyteller and an author for this article provides



FIGURE 2 Aunty Ellen shared her weaving knowledge and storytelling via Zoom. Link to the larger file: https://drive.google.com/file/d/1KnIZKK75_XR1pWwiOYu_JqENVMEyW5s/view?usp=sharing

reassurance and ownership of the stories, which protect her knowledge once they digitally enter the unfamiliar environment (Williams & Hardison, 2013). The stories and activities included in this article were recorded and the ICT4D development was implemented during the first wave of the COVID-19 pandemic.

Figure 2 demonstrates the mobile devices used to implement the Ngarrindjeri ICT4D project.

1. *Mobile phone*: the device was used as a hotspot to connect to the Internet. Camp Coorong has no connection to technology infrastructure and digital equipment, so the first author personally bought the equipment apart from Tablet 1, provided by the Australian National University (3A Institute). Our ICT training sessions and the implementation of the ICT4D were a challenge because we were at the mercy of the Camp Coorong weather, often experiencing Internet connection dropouts. So, to cope with the Internet connection issues, we used Aunty Ellen's mobile handset as a backup speakerphone.
2. *Tablets (2)*: these devices are used for close-up recording of the weaving process; that is, Tablet 1 was placed closer to Aunty Ellen to video stream at close range showing the movement of her hands; also, Tablet 1 is linked to the second tablet and used as Aunty Ellen's second screen allowing her to see the movements of her hands.
3. *Computer (2)*: the main computer was used as a central screen monitor for Aunty Ellen to connect, view and talk to interstate participants. During the COVID-19 lockdown, we had to access the information digitally. So, the second computer was used as a notepad to read and view the program and schedule each day.

The ICT training was invaluable in understanding the mobile devices and navigating the online environment of the Zoom video conferencing interface. Ethical consideration is highly regarded as a form of reconciliation throughout the process and embracing Ngarrindjeri ways of knowledge sharing.

3 | FINDINGS: NGARRINDJERI KNOWLEDGE CONTINUITY—CREATING THE E-LEARNING WEAVING INSTRUCTIONAL VIDEO

The continuity of Aunty Ellen's knowledge benefited from adapting the ICT4D as a platform to express the intricacies of Ngarrindjeri weaving (Figure 3). In this context, the ICT4D method afforded the maintenance of spoken knowledge and, simultaneously, shows the continuing vulnerability of Aunty Ellen's cultural stories.



FIGURE 3 Screen capture of Aunty Ellen Trevorrow, link to the recording of the “Ngarrindjeri e-learning weaving instructional video,” <https://drive.google.com/file/d/11Kvpykk-DP0p0LFII5rTGsxJFZ23LHCm/view?usp=sharing>

Noticeably, a contributing factor to knowledge continuity is knowing the cyclical behavior of oral wisdom. For example, the materials used for weaving are affected by environmental life-cycle changes, geography, growth stages and environmental salinity, a suitable time to pick the rushes and the length of period allocated for drying the rushes, which is a soaking procedure that occurs before the weaving materials are ready for use. These information references are essential for Indigenous knowledge continuity as they relate to holistic views of traditional beliefs, culture, and practices (Haines, 2021; Yunkaporta & McGinty, 2009; Zaman & Wee, 2014). Like Aunty Ellen said.

Picking rushes for weaving is part of storytelling and family time out in the land; getting the rushes ready for weaving takes time; we have to dry them; first, we can't use the fresh pick straight away. We have to spread and dry them on the rack for a couple of weeks. We have to keep them turning so that they will properly. Drying the rushes helps them to get rid of the oil [outer layer of the rushes] on them, and we have to look after the rushes because it's not many of them around. We have to travel because they are growing close to us, and they are not growing as used to be because of environmental change of the land ... everything is connected; it's important to know it (Trevorrow, E., personal communication, September 28, 2020).

Aunty Ellen's statement illustrates the continuing technological and environmental challenges that affect the continuity of oral knowledge. Contextually, a sizable

portion of Aunty Ellen's knowledge is linked to the land, her stories, as one of the last Fringe Dwellers and her experiential learning grounded in interconnected and interdependent ways of thinking (Haines, 2021). By bringing the ICT4D, the sharing and dissemination of her knowledge have changed, and Aunty Ellen immediately embraced the Zoom platform of sharing her knowledge of weaving and storytelling (e.g., Figure 3). Mobile devices are not just objects that are being used, but extension devices significantly affected Aunty Ellen's digital learning proficiency (Norton, 2020; Sterling & Rangaswamy, 2010).

The video segment epitomizes weaving as a tool and a formal process of transferring knowledge and stories to future learners. Weaving is viewed as a metaphor for the resilience and vulnerability of oral tradition. Because traditional stories are treated as a community resource and sacred, there is a high degree of anticipation to keep them in oral form. Thus, the Ngarrindjeri Weaving, languages, stories, and people are interconnected. Moreover, her voice is a written testament to maintaining the oral form of knowledge, authenticity and integrity of cultural stories and communal practices. However, Aunty Ellen remains adamant about the uncertainties and knowledge safety once her stories are converted to digital format and published online. Aunty Ellen fears that the Internet may replace the traditional ways of storytelling, and younger generations will lose their connection to their Indigenous land and country. Other concerns point to the accuracy of interpretation and analysis of stories. Despite this challenging socioeconomic and political context, the ICT4D demonstrates meaningful ways of using mobile devices to enhance Aunty Ellen's practices and knowledge-sharing approaches. Video recording validation is crucial to reassuring Aunty Ellen that preserving her cultural knowledge and its content is appropriately recorded (Haines, 2021).

The e-learning instructional video contains a collection of fast visual and moving information on unseen behavior, which is crucial to digital archiving and preservation management. Moreover, the video recording contains valuable information for a holistic approach to Ngarrindjeri stories and cultural activities preservation management for future generations to inherit. In addition, the *Ngarrindjeri e-learning weaving instructional video* serves as an active research data-gathering tool to collect empirical information for the ethical dissemination of research findings (Schembri & Boyle, 2013). Montague (2016) and Tibben (2015) suggested several advantages and disadvantages to using video attributing to recorded oral stories' authenticity and validity.

TABLE 3 Media file text information of the Ngarrindjeri e-learning weaving instructional video

Ngarrindjeri storyteller	Aunty Ellen Trevorrow
Ethnicity/Indigenous	Ngarrindjeri, South Australia
Cultural stories/practices	Ngarrindjeri Weaving
Format	Recording—8761.MOV, AVC (refers to how something is arranged or set out)
Format profile	QuickTime (specifies a multimedia container file that contains one or more tracks, each of which stores a particular type of data: Audio, video, effects, or text)
Codec ID	qt 2007.09 (qt /CAEP) (a unique registered identifier that represents the encoding stored within the track video)
File size	.98 GiB3 (measure how much data a computer file contains or how much storage it consumes)
Duration	12 min 0 s
Overall bit rate	47.4 Mb/s (combination of the video stream and audio stream in a file with the majority coming from the video stream)
Encoded date	UTC September 28, 2020 10:45:22
com. apple. QuickTime. Model	Canon EOS 700D (camera model used to record)
Bit rate	45.9 Mb/s (refers to the depth of information in the video clip)
Width	1,920 pixels (often refers to "Full HD").
Height	1,080 pixels
Original height	1,088 pixels
Display aspect ratio	16:9 (the screen size displayed on a desktop computer)
Frame rate	25.000 FPS (standard frame for seamless audio-visual experience)
Bit depth	8 bits (videos shot—RGB using 256 levels of color per channel)
Bits/(Pixel * Frame)	0.885 (amount of data allocated to each pixel in the video)
Stream size	3.85 GiB (97%) —Resolution/ measurement of the video width by height, and it is measured in pixel (1920 × 1088)
Language	English
Codec configuration box	avcC (video compatibility to other devices format)

Advantages:

- Provides an engaging method to communicate, and social interaction is more dynamic and can be used on mobile phones and many other platforms, such as mobile phone televisions, tablets, and so forth.
- Ability to create video segments to focus on, allowing a high level of scientific analysis and rigor beyond anecdotal observation and interview.
- As a method, video ethnography fills the gap that traditional interviewing may overlook.
- Traditional interviewing often alienates participants' views; the video ethnography approach allows the storytellers to express their voices without bias.

Disadvantages:

- Technological failure (recorded stories can be corrupted or poorly recorded).
- Devoid of personal connection in face-to-face communication.
- Moreover, high initial cost; while the video has some drawbacks, its advantages far outweigh the disadvantages of using video.

On the other hand, the media file text information in the video creates another layer of data valuable for digital preservation and appropriately preserves Aunty Ellen's knowledge of weaving and storytelling (Table 3). Table 3 specifies a separate unit of the written text information Ngarrindjeri e-learning weaving instructional video (Figure 3). The Ngarrindjeri e-learning weaving instructional video's media file information will allow the film preservationist to encode data for compression, storage, and sharing.

Furthermore, the media file text information of the *Ngarrindjeri e-learning weaving instructional video* is a code of attribution and is vitally important for future knowledge digitization and management of oral wisdom (Figure 3 and Table 3).

4 | CONCLUSION AND FUTURE RESEARCH

This article has drawn attention to the continuing digital divide and information disparity experienced by Indigenous people. As expected, the first wave of the pandemic had affected the Ngarrindjeri community, and many resources were redirected toward protecting the Elders and acknowledging their increased risk of the virus. Thus, the COVID-19 pandemic has merited Aunty Ellen's resilience to adapt and learn in a brief time in navigating

the Zoom interface and positively shifted the focus on the way she used mobile devices to share her knowledge, influencing the creation of "*Ngarrindjeri e-learning weaving instructional video*" for future online learners. The video ethnographic use of the CBPR principle allows digital recording, translating, and disseminating of Ngarrindjeri stories and weaving to be digitally and ethically transcribed from oral form to written text with more significant impact directed back to the community. Methodologically combining CBPR principles, Video Ethnography in conjunction with the ICT4D platform to implement the virtual "*Ngarrindjeri Weaving Workshop*" and the "*Yarning Online On Country*" projects dismantled the idea that the researcher is the expert rather; the focus is centered on Aunty Ellen's will-power and determination to break the barriers to inequalities in research. Notably, the "*Ngarrindjeri ICT4D Pondi (Murray Cod)*" visual design provides a graphical framework and guidelines to absorb information quickly (Figure 1). Understandably, ICT devices, apps and software are constantly changing, so implementing ICT4D in the traditional context means that local users continue to experience disparity in technological knowledge and skills, particularly equal access to the Internet connection and affordability to mobile devices. Hence, the formation of the framework shows the theoretical elements of cultural narratives and ethical processes; training needed for making a real connection to the culture and tradition using the totem of Aunty Ellen, which is vital to the successful implementation of ICT4D projects and future digital preservation management of oral knowledge (Figures 1–3). In addition, the framework has played an invaluable visual guideline for future projects. Feasible strategies are defining fair research procedures, interpreting findings ethically and building on the cumulative body of ICT4D knowledge to test the framework in other community settings to increase the diversity of the Indigenous community's participation in ICT4D projects (Erstad et al., 2020).

Going forward, cultural ICT4D requires high levels of understanding and explicit agendas to deliver the programs that will bring long-term impact to the Indigenous community. As noted, COVID-19 worsened the issue of societal inequality, equal access to ICT and digital tools designed for traditional users. Nevertheless, the Ngarrindjeri ICT4D project provides insights into the theoretical and practical experiences and valuable strategies to close the gap of Indigenous information disparity. In addition, this study is a valuable resource for future research, particularly empirical-based findings valuable for future digital preservation and management of oral stories and practices useful for LIS professionals (Kleine & Unwin, 2009).

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APPENDIX A

First author role: Cultural Advisor and Technical Assistant.

METHODS: IMPLEMENTATION PROCESS OF THE VIRTUAL NGARRINDJERI PROJECT

Collaboration: University: 3Ai Institute—Australian National University.

Project description: This project culminated from a previous collaboration with Aunty Ellen and ANU University.

Training dates (2021)	June 2020–September 2020: Work task Weaving as connection, metaphor and meaning through story, family, place, history, culture, politics
June	ANU weaving workshop—ICT Training (6 hr), mainly focused on getting Aunty to familiarize themselves with the technology we were using for our first Zoom meeting
July 31	ANU weaving workshop—ICT Training (6 hr) Using one computer, tablet, and mobile phone—Learning to connect three devices and addressing the challenges of Internet connection dropouts
August 21	ANU weaving workshop—ICT Training (6 hr)—ANU sent a new tablet, and the first author bought a new computer to replace the one-practice run, connecting all four mobile devices and sorting which devices will focus on Aunty Ellen's hand and adjusting on which computer monitor for aunty Ellen see the students
September 3–4, 2021 2 days, 10 a.m. –4 p.m.	Implementation of “Virtual Ngarrindjeri weaving workshop”: The 2 day virtual weaving workshop focuses on weaving as a connection and metaphor to Ngarrindjeri on-country activities and storytelling to take you into the complexities of the Ngarrindjeri history, culture, politics, and survival
<i>Implementation day (collaboration)—Agenda for 2 days of virtual weaving</i>	
Third of September 10 a.m.–4 p.m.	Work task—10.00 a.m. [9.30 a.m. SA time]: Discussion on protocols and introductions 11 a.m.–12 p.m.: Let us weave Aunty Ellen demonstration Virtual students: Setting up their equipment ready for weaving session (starter, rushes, skewer, “How to weave” photocopy). Aunty Ellen and Jelina Haines virtually assisted the students 12.45 p.m.–2.15 p.m. [12.15–1.45 p.m. SA time]: Ngarrindjeri history, politics and weaving; watch the video—Weaving and whispers: Miwi wisdom after the movie, continue the virtual Weaving 2.30–4.00 p.m. [2.00 p.m.–3.30 p.m. SA time] Stories from your “country” focus on knowledge sharing of stories from the studies and artworks that are important for the students. Jelina shared her how to preserve artifacts shared by the students Finished 3:30 p.m.
September 4, 2021 10 a.m.–3:30 p.m.	10.00 a.m.–noon [9.30–11.30 a.m. SA time]: Weaving continues <ul style="list-style-type: none"> • Complete weaving with the Ngarrindjeri rushes • Aunty Ellen Trevorrow and Jelina Haines virtually conduct one on one reviews of students' work • Continued the conversations to share home' home stories 12.45–2.30 p.m. [12.15–2.00 p.m.]: Weaving and storytelling This time Aunty Ellen and Jelina shared their stories and how they made it there and how their love of weaving is sustaining it 2.45–3.45 p.m. [2.15–3.15 p.m. SA time]: Wrap up students virtually present their finished Weaving to Aunty Ellen 3.45–4.00 p.m. [3.15–3.30 p.m. SA time]: Nukkan—Virtual farewell message from Aunty Ellen to ANU students

APPENDIX B

**METHODS: IMPLEMENTATION PROCESS—
YARNING ONLINE ON COUNTRY PROJECT**

Yarning Online on Country project aimed to connect people, place, and knowledge through weaving and collaborating with elders and women from Bourke, New Wales. Some elders are introduced and work with other artists through weaving. Other women want to continue the project and reconnect, regenerate, harvest and prepare the Spiny Sedge that grows along the Baaka (Darling River).

Collaboration: University: Arts & Social Sciences—The University of New England, Taragara Aboriginal Corporation and Aunty Ellen Trevorrow.

First author role: Technical Program Coordinator and Cultural Weaver.

We adopted the ICT skills we gained from our previous with the ANU University.

Both projects used weaving to connect with Elders, cultural weavers, and students virtually. The first author's mobile phone became an invaluable tool as hotspot Wi-Fi and maintaining our connection to ZOOM. Allocated dates and times for the weaving sessions were negotiated and carefully aligned with the weather at Camp Coorong. Contingencies were also embedded in the planning in bad weather where connection to the Internet would be impossible.

Weaving schedule	October 2020–March 2021 Work task
<i>Stage 1</i>	
29th October 2020 1–3 p.m. EST	<i>Virtual weaving workshop via ZOOM</i> Getting to know the Elders from Bourke and Aunty Ellen welcoming them to Ngarrindjeri country. Aunty Ellen begins by telling her story, the journey of her weaving practice and generation cultural ancestors. Weaving session
05 November 2020 1–3 p.m. EST	<i>Virtual weaving workshop via ZOOM</i> Continue weaving on the works started in the previous session
12th November 2020 12.30–4:30 p.m. (EST)	<i>Virtual weaving workshop via ZOOM</i> 1–2 p.m.: Presentation, Q&A, Show and tell on the current stage of the Weaving 2–3 p.m.: Sharing stories and continue weaving 3–10 p.m.: Coffee break (15 min) 3:25–4 p.m.: Plan the Stage 2 project and wrap up
19th November 2020 1–3 p.m. EST	<i>Virtual weaving workshop via ZOOM</i> Continue weaving on the works started in the previous session. Show and tell of finished weaving work
<i>Stage 2: Yarning online on country project—Negotiation process</i>	
Online country: KurruPurra Pila Weaving, Bourke, New South Wales March 2021–2022 2 days Tuesday and Wednesday 10:30 a.m.–1:30 p.m.	<i>Virtual Weaving On Country—Waiting for the outcome of the grants application</i> • Learning directly from Aunty Ellen the style, techniques and harvesting processes, the stories, and how the Baaka (Darling River) mob are connected to the Ngarrindjeri through our rivers, the Songlines and the Spiny Sedge and the weaving styles and techniques