

Indigenous Knowledge-Sharing Interventions in Australia and the Use of Information and Communication Technology: A Scoping Review

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Abstract

Indigenous peoples in Australia are subject to significant disadvantages both socio-economically and in health, education and service provision. Knowledge-sharing interventions, including those with an information and communication technology (ICT) base, have the potential to address these challenges. Interventions occur against a background of an ancient culture with distinctive ways of knowing and doing, including storytelling, art and performance. This study documents the results of a scoping review of interventions that have been undertaken in this context. It considers the outcomes of these interventions, the extent to which Indigenous ways of knowing were accounted for and whether ICT was involved. Our review of the peer-reviewed literature located two prior reviews and seven primary studies. All of the primary studies were about health interventions; of these, all those that reported positive outcomes only had incorporated Indigenous ways of knowing, some in innovative ways. Only two studies used ICT as their main vehicle. This article provides a base for further work by documenting the current status of the field and identifying gaps, such as the scarcity of non-health and ICT-based studies. The cases identified provide useful insights for those with an interest in developing future initiatives.

Keywords: Indigenous knowledge, knowledge transfer, knowledge sharing, Aboriginal, Information and Communication Technology, intervention.

1 Introduction

Indigenous peoples make up six per cent of the world population, estimated at 476 million people (World Bank, 2022). They are holders of traditional knowledge linked to land, natural resources, ancestry and culture (World Bank, 2022). Many Indigenous peoples have endured eviction from their land and relocation through colonization and, currently, Indigenous people account for 19% of the extreme poor globally (World Bank, 2022). As with minority groups

generally, Indigenous peoples face many challenges, particularly from institutional racism affecting access to and equitable distribution of resources and services, leading to socioeconomic, health, educational, vocational and judicial disadvantages (Elias & Paradies, 2021).

The position of Indigenous Australians¹ is, in many respects, similar to Indigenous peoples globally, with the same disadvantages further amplified by the geographical scale of Australia that means that some communities are very remote (Wilson & Waqanaviti, 2021). The Council of Australian Governments in 2007 identified substantial disadvantages experienced by Indigenous Australians in many areas, including life expectancy, children's mortality, education and employment. The Australian Government is continuing to address these challenges through the "Closing the Gap" initiative (Australian Government, 2020).

The rise of networked technologies such as the internet presents new challenges for equitable access to and distribution of digital capacity and resources for minority groups, including Indigenous people (Hunter & Radoll, 2020). On the one hand, digital communications offer additional capacity to improve knowledge-sharing and information-brokerage; on the other hand, digital resources and infrastructure are not consistently available within remote communities and can also present certain risks to vulnerable members of the community. Further, the use of ICT and non-Indigenous approaches to knowledge-sharing incorporating ICT may not align with traditional Indigenous ways of sharing knowledge, rendering such efforts to address pressing social challenges ineffective. It has been argued, for example, that ICT design methods in Australia should follow a paradigm that encompasses the place, relationships, agency and Indigenous ways of knowing, disrupting structures of learning, design and research based on colonialism (Ibinarriaga & Martin, 2021).

Some on-the-ground studies indicate that knowledge-sharing strategies (interventions)² can assist Indigenous people to address contemporary challenges in some circumstances. One such example is a program aimed at developing suicide prevention expertise within Australian Aboriginal communities using ICT and multimedia approaches (Gorman & Ward, 2008). However, the challenge for those intending to manage, design, develop or utilize knowledge-sharing interventions with Indigenous Australians, with or without ICT, is that there are very few high-level research insights documenting the nature of such interventions and their efficacy. Some prior reviews exist (see, for example, Brusse et al. (2014)) but they are limited to specific areas or technologies.

This challenge had relevance for this paper's authors, as our research team is engaged in a wider project in which we are investigating issues and possible interventions employing ICT to address knowledge gaps in relation to children's online safety amongst Australian

¹ The focus of the paper is on Indigenous people in Australia. The terms "Indigenous people in Australia" "Indigenous Australians" and "Indigenous" and "Aboriginal" without qualification denote these people and are used interchangeably. Further clarification is provided when the reference is to Indigenous peoples globally.

² An intervention is defined as "An action or provision of a service to produce an outcome or modify a situation" (Dudgeon, Luxford & Cox, 2016, p. x). The term "intervention" should not be seen as having any negative connotation (e.g. as shown also in Brusse et al., 2014). The Indigenous community may itself institute and carry out the intervention. Alternative terms used are "approach", "program", "project" or "implemented strategy".

Indigenous parents and caregivers³. One of the paper's authors is Indigenous and the project is guided by an Indigenous reference group.

Against this background, the current article documents a scoping review that addresses the following research questions: (1) What interventions have been developed, in what circumstances and with what outcomes, to help facilitate knowledge-sharing with Indigenous communities in Australia? (2) How did these interventions take account of Indigenous ways of knowing, being and doing, if at all? (3) How was ICT involved in these interventions, if at all?

The literature review was limited to interventions focusing on Indigenous Australian populations. Indigenous Australian culture and history have commonalities with Indigenous populations elsewhere, but differences do exist and so a restricted focus is appropriate. Studies were included in the review if they focused on a knowledge-sharing intervention, whether or not the intervention was ICT based. Our reasoning was that knowledge about non-ICT-based interventions is useful in its own right, but also that these interventions could provide evidence and ideas for future ICT-based projects. Further in some cases, ICT might play a subsidiary role in an intervention without being the primary vehicle. The scope of the review was limited to peer-reviewed literature.

Our work's main contribution is a review of the evidence base for knowledge-sharing interventions involving Indigenous Australians. Thus, the work identifies potentially effective strategies that can be embedded in ICT-based innovations. Further, the research has the potential to assist with the design and development of effective interventions that take Indigenous traditions into account. The review provides a base for further cumulative knowledge consolidation in the area of knowledge-sharing with Indigenous communities.

The paper proceeds by first giving an overview of the situation faced by Indigenous Australians, their knowledge-sharing practices and use of ICT and different approaches proposed for developing interventions in this context. It then describes our scoping review approach and presents results followed by a discussion.

2 Indigenous Australians and Knowledge-Sharing

2.1 Overview

Indigenous Australians, comprised of Aboriginal and Torres Strait Islander peoples, accounted for 3.2 per cent (812,300) of the Australian population of 25,500,000 in 2021 (Australian Bureau of Statistics, 2022). Ninety-one per cent of the Indigenous population identified as Aboriginal, about 5 per cent as Torres Strait Islander, and the others both Aboriginal and Torres Strait Islander (Australian Institute of Health and Welfare, 2021). Australia's Indigenous people are said to be the world's oldest civilisation, with 65,000 years of sustained cultural traditions (Althaus, 2020). Indigenous people live in all parts of the country, including in major cities and remote and desert areas. The states of New South Wales and Queensland have sizeable Indigenous populations, as well as the Northern Territory where Indigenous people account for one-third of the Territory's population (Australian Institute of Health and Welfare, 2021).

³ Relevant issues and research by the Australian Government are described in eSafety Commissioner (2022).

The sorry history of colonization for Indigenous people in Australia since 1788 is documented in texts such as that produced by the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS, 2021). Such works describe the dispossession of land, conflicts, restrictions on Indigenous people through protection acts, removal of children from their parents and other discriminatory treatment. In some regions, Indigenous people were moved to specially created reserves, taking them away from their country, food, sacred sites and families. Despite this history, Indigenous people celebrate many achievements, including but not limited to music, theatre and dance, visual art, film and television, literature, media and sport. Although the effects of colonization on Indigenous Australians are many, here we focus on aspects that appear most relevant to the current work, particularly those concerning Indigenous culture and ways of knowing, being and doing.

While Indigenous Australians have many similarities, including a shared colonist story, each of many groups has a unique cultural identity with distinct histories, traditions and languages (Whitehouse et al., 2014). Of the 250 languages at the time of European settlement, only 150 have remained post-colonization (Applebee, 2020). Culture and land are integral to Indigenous identity. Hence, for Aboriginal and Torres Strait Islander peoples, land is not a commodity or asset that is owned but an entity that encompasses nature, animals and plants, with which they have a deep spiritual, physical, social and cultural connection (Whitehouse et al., 2014). Country in this instance is not just a place of origin or geographical area, but an interconnection of land and sea areas that epitomises the existence, ways of life and spirituality of Indigenous people (Whitehouse et al., 2014). For Indigenous people, “Country is family, culture, identity. Country is self” (Kwaymullina, 2005, p 12), and kinship reflects a deep sense of connection to country, family and community (Bourke et al., 1998). It is believed that Indigenous peoples’ relationships with land and country and undertaking traditional rituals is why the Indigenous culture and identity have survived over the years despite colonizing forces (Applebee, 2020; Schillhorn, 1999). These cultures have continued to be passed on from generation to generation through unique Indigenous ways of knowing.

Older people are seen as custodians of culture in Indigenous communities. Being old, however, does not automatically ensure status as an Elder, with the position coming from respect for someone’s moral authority and cultural knowledge. Elders play a strong role in the decision-making of a community. People given the status of Elder may be referred to as “aunty” or “uncle” as a sign of respect (Behrendt, 2021). Further, specific roles in the community may be assigned to women and men, especially with respect to cultural stories and spiritual life (Behrendt, 2021). Sharing based on reciprocity is a strong value within Indigenous communities. People are expected to share resources and food and help others when needed and will expect help in return when in need themselves (Behrendt, 2021).

Indigenous people today live in diverse circumstances across Australia, from remote communities to urban areas. Distinctive cultural values are still evident, including living communally, knowing where you are from, restrictions on who can know what, an equal place for women, culture dependent on storytelling, and connecting to the environment (Behrendt, 2021).

2.2 Indigenous Ways of Knowing and Communicating

Australian Indigenous knowledge is considered sacred – a spirit that transforms the holder. The person transferring knowledge does so not as an individual but as part of a process in which the holder has a responsibility rather than a right to ownership (Brady, 1997). In

scientific studies, it is common practice to have a definition of the concepts, attributes or terminologies used to provide the scope and context of the study. Indigenous scholars caution against a definition for 'Indigenous knowledge' as, although it is a widely accepted term amongst Aboriginal and Torres Strait Islander peoples (Weiss et al., 2013), Indigenous people have diverse groups with distinct cultures, traditions and ceremonies that constrain definition. Nonetheless, Berkes et al.'s (2000) analysis of traditional Indigenous knowledge in the international literature has been widely accepted (Weiss et al., 2013) and describes Indigenous knowledge as comprised of locally situated factual or empirical management systems, norms, values and beliefs held by communities that are shared, transformed and passed on from generation to generation. Intergenerational transfer of knowledge and cultural traditions occurs via several means, including orally through stories.

Storytelling is a long-standing tradition and knowledge transfer strategy of Indigenous people. Iseke (2013) describes it as an invaluable tool that sustains Indigenous communities worldwide, nurtures relationships, and validates people's lived experiences. Storytelling can take several forms and includes casual conversations during daily interactions and while undertaking activities such as farming, hunting, food-sharing and traditional ceremonies with Elders, where children are taught with love and recognised for their achievements (Blenkinsop, 2017). In Australia, some traditional healers report the use of daily early-morning stories (*alpiri*) as a mechanism to prepare the mind for the day ahead and to organise the tasks to be achieved (Ngaanyatarra Pitjantjatjara Yankunytjatjara Women's Council Aboriginal Corporation, 2021). Indigenous storytelling also takes more structured conversational approaches, such as *Engoori*, *Dadirri* and *Yarning*. *Engoori* is a strength-based conversational approach with roots found in the Mithaka-Tjimpa people of South-West Queensland, traditionally used as a diplomatic approach to resolving misunderstandings between conflicting ideologies and groups (Spillman, 2018). The *Engoori* process now extends to other areas, including as an epistemological framework and research methodology, a deep learning approach in the classroom and an organisational tool to strengthen processes (Waller et al., 2018). *Dadirri* is a form of deep listening to the stories told by Elders which originated from the Ngangikurungkurr people of the Daly River in the Northern Territory (Coombes & Ryder, 2020). *Yarning* is widely used by Indigenous people from around the world to build respectful relationships and to preserve and pass on traditional knowledge (Bessarab & Ng'andu, 2010; Osmond & Phillips, 2019). These conversational storytelling techniques have been extended to research methods as they facilitate a respectful and honest interaction between researchers and participants, enabling researchers to learn about the issues being discussed (Applebee, 2020; Coombes & Ryder, 2020), while breaking formalities and creating a conducive interaction atmosphere of equal partnership where researchers and participants are both knowers and learners (Bessarab & Ng'andu, 2010).

Indigenous visual art and crafts are symbolic and creative means of communication that have been transmitted over generations (Ngaanyatarra Pitjantjatjara Yankunytjatjara Women's Council Aboriginal Corporation, 2021). These symbols hold historical, spiritual and cultural significance (Cameron, 2015). The arts and the often collaborative act of making these works demonstrate how Indigenous people value thinking, dreaming and imagining in a slow, respectful and careful manner as they seek to communicate deeply spiritual and practical lore and cultural messages (Ngaanyatarra Pitjantjatjara Yankunytjatjara Women's Council Aboriginal Corporation, 2021). Thus, semiotics play a significant role in Indigenous ways of communication and carry deep meanings, such as the relationships between people, animals,

the earth, the moon and the sun. Some authors show that Indigenous dot art is believed to be used in healing and ceremonial processes (Cameron, 2015). However, colonization has led to diminished respect for traditional knowledge (Ngaanyatarra Pitjantjatjara Yankunytjatjara Women's Council Aboriginal Corporation, 2021) and misrepresentations of Indigenous art are common. For example, Sim (1966) found that circles on the rocks in Dharug Country in NSW did not represent the sun and the moon as misinterpreted by Western artists but, rather, they depict the sacred connections between people and places. The misrepresentation of Indigenous knowledge continues to be problematic and is of concern to many Indigenous people (Ngaanyatarra Pitjantjatjara Yankunytjatjara Women's Council Aboriginal Corporation, 2021).

Music and dance are powerful mediums for expressing Indigenous cultural identity and maintaining a connection to the home Country. The term 'corroboree' implies the participatory public performance of songs and dances, an equivalent to modern theatre. However, it is much more than just a celebration or entertainment, where songwriting, singing, and dance continue to build pride on a broad communal level (Fuery, 1993). Aboriginal people claim that dance rituals function to bring Dreaming power and presence into the time and places and bodies of the performers, according to anthropologists (e.g. Ellis, 1985).

Indigenous dance performances can include performers wearing ochre faces and body paint to portray a connection to a totem, family or other cultural elements. Costumes or dress are created using various types of Australian animal fur, feathers combined with coloured fabric, traditional tools and small branches from local trees and plants. Dances sometimes involve a ceremonial smoking ceremony to evoke cleansing (Ngaanyatarra Pitjantjatjara Yankunytjatjara Women's Council Aboriginal Corporation, 2021). Dances can tell stories using mimicking of various animal motions and elements of nature or depict everyday activities. Didgeridoo, yidaki, rhythm, clapping sticks and a singer are frequently used as dance accompaniments.

Henry (2000) explores "dance as a form of corporeal politics" (p.322) for Indigenous Australians where people from cultural groups perform in the public arena to express their opposition to the state's bureaucracy. In summary, Indigenous ways of knowing and communicating are diverse and expressed in many creative formats unlike Westernised communication of knowledge. We have been able to provide only a brief overview here and recognise that a richer description is beyond the scope of this manuscript.

2.3 Indigenous Australians' Use of Information and Communications Technology

Several scholars report that Indigenous Australians are enthusiastic users of digital technologies and use them in diverse ways for transferring knowledge, amongst other activities (Brady & Dyson, 2015; Du et al., 2015; Dyson, 2004). Despite considerable barriers to ICT adoption such as cost, lack of adequate infrastructure and low levels of digital literacy (Du & Haines, 2017; Radoll, 2010), the use of ICT has become an important everyday activity for Indigenous Australians (Dyson, 2015) across work, educational and social environments (Radoll, 2010). Research shows that Indigenous people across the globe are typically early adopters of digital technology (Carlson & Frazer, 2018; Latimore et al., 2017) and use ICT for a diverse range of purposes, including information-seeking, playing online games, using social media, listening to music, watching videos, as well as uploading content such as music, photos

and videos to platforms for sharing within their own communities (Du & Haines, 2017; Shaw et al., 2014; Dyson, 2015).

The embodiment of Western values and ideologies in contemporary ICT, and the potential for ICT to represent a new medium of colonization for Indigenous users has, however, been a topic of some debate. ICTs are not neutral but are the products of a particular culture and therefore embody the ideologies of that culture (Dyson, 2004). This raises the question as to whether Indigenous Australians can harness the benefits of ICTs while retaining their own culture. Dyson (2004) highlights the complexity of the issue, with, on the one hand, low ICT adoption rates, but on the other hand a positive response to technologies by many Indigenous Australian users. Despite some active resistance to the use of digital technology in Indigenous knowledge practices (Verran & Christie, 2007), there remains little evidence that Australian Indigenous people are rejecting ICT and the Western values embodied within them (Dyson, 2004). However, Dyson (2004) argues that ICTs must reflect Indigenous culture and be used to “service individual and community goals and aspirations” (p. 65). She further argues:

Rather than view ICTs as inherently loaded with Western Values, it might be more accurate to say that they are only capable of furthering the agenda of the dominant culture if used to that end. Excluding Indigenous people from ICTs on this basis is itself a form of cultural imperialism which seeks to maintain their existing disempowerment and marginalisation. In an age when everything runs on computer technology, Indigenous people, as much as any other, have the need for full access to that technology and power over it. (p. 69)

There are many examples of digital technologies being put to use in ways that remain true to Indigenous culture, enhance Indigenous cultural practices and the transfer of knowledge, and which promote the interests of their traditional groupings, clan lands, histories, connections and place (Verran & Christie, 2007, p 214; Christie and Verran, 2013; Dyson, 2004). Aboriginal Elders are using computer technologies to help teach the younger Indigenous generation to learn and understand the community’s knowledge traditions (Verran & Christie, 2014); web applications are being used to transfer traditional knowledge to younger generations and for community development (Corbett et al., 2009, as cited in Mayerhofer & Taylor, 2010); multimedia archives are being used to store Indigenous knowledge; traditional languages spoken by just a few are being taught using talking books (Mayerhofer & Taylor, 2010); and Facebook is being used to maintain and learn languages and teach cultural traditions and protocols to younger generations (Carlson, 2019). Additionally, Indigenous Australians have demonstrated an interest in using digital technologies in their struggle to develop sustainable livelihoods on their own lands (Verran & Christie, 2007). Social media has been instrumental in providing a platform for Indigenous people to actively contribute to public discourse on topics relevant to Indigenous society, particularly for illuminating the challenges of colonization and its consequences more broadly (for example, Walter, 2022).

Portable devices, especially mobile phones, have become the technology of choice for many Indigenous Communities (Shaw et al., 2014; Brady & Dyson, 2015) and mobile technologies have been enthusiastically adopted in remote Indigenous communities where previous attempts to introduce other ICTs have been unsuccessful (Brady & Dyson, 2015). Many Indigenous communities choose mobiles over fixed-line ICT (Dyson, 2015) despite a lack of sufficient mobile coverage in many remote areas (Shaw et al., 2014). This choice is due to the relatively low cost of mobile devices and the convenience of being able to communicate while away from home. Mobile phones form a ‘conduit of connection’ within Indigenous

communities helping to facilitate connections between family members, maintain cultural and language links, and support Indigenous people's mobility (Brady & Dyson, 2015, p. 29). Additionally, Indigenous people value mobile phones and other portable devices such as MP3 players and iPods for entertainment purposes such as listening to music, playing games, and watching videos, as well as sharing, storing and viewing content such as photos (Shaw et al., 2014; Brady & Dyson, 2015). Brady and Dyson (2015) observed the close fit of the multi-media features of mobile devices and traditional cultural strengths, namely oral and audio practices and pictorial expression. Consistent with Indigenous values of sharing and reciprocity, devices are often shared amongst community members rather than individually owned (Shaw et al., 2014). Social media use has become an everyday, typical activity, especially for young Indigenous Australians. More than 60 per cent of Indigenous people within remote communities are active users of social media – a rate that is higher than the general population (Callinan, 2014).

In sum, ICTs, particularly mobile technologies, are an important part of many Indigenous people's daily lives. Indigenous people appreciate the various benefits of ICT and believe that they have the capacity to improve their lives in terms of access to online government services, health consultations, online education, and job opportunities (Du & Haines, 2017). ICTs have the potential to address the continuing disadvantages experienced by Indigenous communities by improving access to educational, governmental, financial and health services (Radoll, 2010). Significant barriers remain, however, which stand in the way of realising the full suite of benefits of ICT, including knowledge transfer and furthering Indigenous people's cultural aims and objectives. These include its cost (initial adoption as well as ongoing retention); insufficient infrastructure in remote communities; and low levels of digital literacy in some areas (Hunter & Radoll, 2020; Dyson, 2004; Du & Haines, 2017).

2.4 Knowledge Sharing Interventions

The prior discussion has dealt with the culture and distinctive ways of knowing, being and doing of Indigenous people, particularly those in Australia. It has also been shown that Indigenous Australians have been able to adapt and use ICT developed in other cultures for their own purposes to a considerable extent. However, questions remain that motivated this study: namely, how should interventions that deal with the development of ICT specifically for purposes meant to benefit Indigenous Australians be undertaken (i.e. the process); and what forms should they take (i.e. the content or product)? The first question is a matter of some debate, while our initial investigation showed that the extant literature yielded little in regard to the second question at an overview level.

Research approaches that address the development of new artifacts or new ways of doing something are referred to as *design research* or *design science research* in fields including information system and management (e.g. see Gregor & Hevner, 2013; Denyer et al., 2008). These approaches deal with the development of prescriptive "how to" knowledge rather than the descriptive "what is" knowledge that has typified disciplinary areas such as the natural sciences. The term *design* alone may be used more at the level of professional practice. Akama et al. (2019), for example, uses the label *design* for methods such as those practised in Human-Centred Design at the Stanford school. A variant on *design science research* is *action design research* (Sein et al., 2011), which pays attention simultaneously to building innovative IT artifacts in context and interwoven learning from the intervention. At the professional practice level consideration of an Indigenous context could occur through user involvement in a

traditional *systems development approach*. As pointed out, however, in a critical case study of an ICT4D intervention with Indigenous people in Taiwan, there were a number of unfortunate outcomes of this approach including the Aboriginal people feeling marginalized and without a voice (Lin et al., 2015).

All the approaches and methods referred to above were developed with little questioning of the limits to their applicability across cultures, and subsequently the universality of such design approaches and methods has been questioned. For example, the anthropologist Escobar (2015) sees that a Euro-American perspective on design has been “exported to many world regions over the past few hundred years through colonialism, development and globalization” (p. 14). Akama et al. (2019) provide critical discussion of problems relating to universality in design education and the reinforcement of modernist ideologies in relation to First Peoples in Australia and New Zealand. These authors, however, see a nascent but growing movement towards design’s decolonization. They provide personal, reflexive stories and propose:

respectful, reciprocal and relational approaches as an ontology of co-designing social innovation. This ontology requires a sensitivity to design’s location within multi-layered sites of power, knowledge, practices, cultural values, and precarious asymmetries as condition of collaboration (p. 2).

Further approaches are discussed by Brereton et al. (2014) in relation to human-computer interaction. One approach identified is ethnography combined with action research and *rapid ethnography*. Here, ethnography can be seen as a form of data collection. Brereton et al. (2014) however, consider that such approaches can lead to a false sense of expertise on the part of the researcher and possibly arrogance. Further, as a result of the history of ethnographic research, which was employed by colonial administrators interested in managing others (the native peoples of colonies), there can be wariness in Aboriginal communities about being investigated. These authors also mention the use of *participatory design* and *co-design*, which they see as concerned with the bringing together of participants who can bring their own knowledge and expertise to a project. They suggest, however, that participatory methods may need to be revised in the context of remote Aboriginal communities, so as to be compatible with their socio-cultural habits.

A number of specific approaches have been proposed for projects involving Indigenous Australians, although different terms are employed: for example, an *eight ways of knowing framework* (Yunkaporta & McGinty, 2009); *Indigenous leadership and partnership* (Dudgeon et al., 2016); *co-design* (Ibinrriaga & Martin, 2021); *community-led development* (Mitchell et al., 2021); and *country-centred design* (Janke, 2021, p. 301). Wilson (2008) developed a *relationships based methodology* based on work with Indigenous scholars in Canada and Australia.

The approaches above provide some guidance with respect to methods and processes for those seeking to undertake interventions for knowledge sharing in Indigenous communities. The work reported shows ways in which a number of stakeholders, both from within and without these communities, can work together respectfully and with reciprocation in knowledge sharing. Interventions may be initiated from within a community as well as from an external agency. For example, Brereton et al. (2014, p. 1184), who emphasize “engagement and reciprocity first!”, describe how their relationships with communities on Groote Eylandt developed in a project on cane toad invasion and then led to a “digital noticeboard” project that was initiated by the community.

Although the literature reviewed here show some commonalities in thinking about approaches to knowledge sharing interventions with Indigenous communities, we were unable to locate prior reviews or cross-case analyses of outcomes of the use of the different approaches. Neither did the extant literature yield reviews that showed analysis of the mechanisms or content that was employed in cases of interventions. These gaps provide justification for the work described further below.

3 Research Approach

3.1 Method

The method used is that of a scoping review (Arksey & O'Malley, 2005; Levac et al., 2010; Peters et al., 2020) which is suitable for a study that aims to review evidence for treatment or intervention when the topic of enquiry is relatively broad and where many different study designs have been used. Paré et al. (2015) identify a scoping review as one that is appropriate for information systems research in their typology of reviews.

One author of the review is a well experienced Indigenous researcher and the project of which it forms part has an Indigenous reference group that advises on all work performed within the scope of the project. The review, even in draft form, has been useful in discussions with the reference group on how to approach the next stages of design in our project, in conjunction with what has arisen from yarning group discussions.

The scoping study followed the five steps proposed by Arksey and O'Malley (2005): (1) identify the research question; (2) identify relevant studies; (3) study selection; (3) chart the data; and (5) collate, summarise and report the results. The recent update for scoping studies by Peters et al. (2020) was taken into account. Peters et al. (2020) note that the sources used in scoping reviews are not likely to lend themselves to meta-analysis and a descriptive approach to reporting is appropriate. Basic coding of data in categories may be useful, particularly when "the purpose is to identify or clarify concepts or definitions within a field or to identify key characteristics related to a concept" (p. 2122).

3.2 Search Strategy

The process began with a comprehensive search of Scopus, ProQuest, Web of Science and Science Direct. These databases were chosen because they are popular and believed to have relevant studies for the review. To ensure the search was exhaustive, it was extended to Informit (a database with a distinct focus on Australian and New Zealand Indigenous research collections). Only peer-reviewed studies from the five databases were considered. Table 1 shows the search string developed to select studies based on the research questions provided in the introduction. The final search terms resulted from an iterative process where the researchers considered the results of different combinations of terms and refined the search so it was neither too broad nor too narrow. The search process was managed using the Covidence software.

| Concept | Search Terms |
|-------------------|---|
| Context | "Indigenous" AND "Australia" |
| Knowledge Sharing | AND ("knowledge transfer" OR "ways of knowing" OR "communication strategy" OR "awareness raising" OR "advice giving") |
| Intervention | AND ("intervention" OR "program" OR "project" OR "technology" OR "strategy") |

Table 1. Search Terms

3.3 Exclusion Criteria

Studies were excluded if: (a) they did not focus on experiences in Australia, or if results for Australia could not be separated from a study that included other regions; (b) they were not aimed directly at Indigenous people (e.g., if aimed at teachers or medical workers who then interact with Indigenous people); (c) the knowledge-sharing aspect could not be separated from some other intervention (e.g., advice could be given on dental care, but dental treatment was also given and outcomes were not evaluated separately, as in Parker et al. (2012)); (d) the focus was on methodology or research practice and there was limited attention to evidence of the outcomes of the intervention; (e) they were speculative articles or feasibility studies.

3.4 Study Selection

The initial search returned 144 studies, reduced to 98 after duplicates were removed. At least two researchers assessed the titles and abstracts of these 98 studies to select articles that represented original empirical research (primary studies) as well as review studies (non-primary studies), taking the exclusion criteria into account.

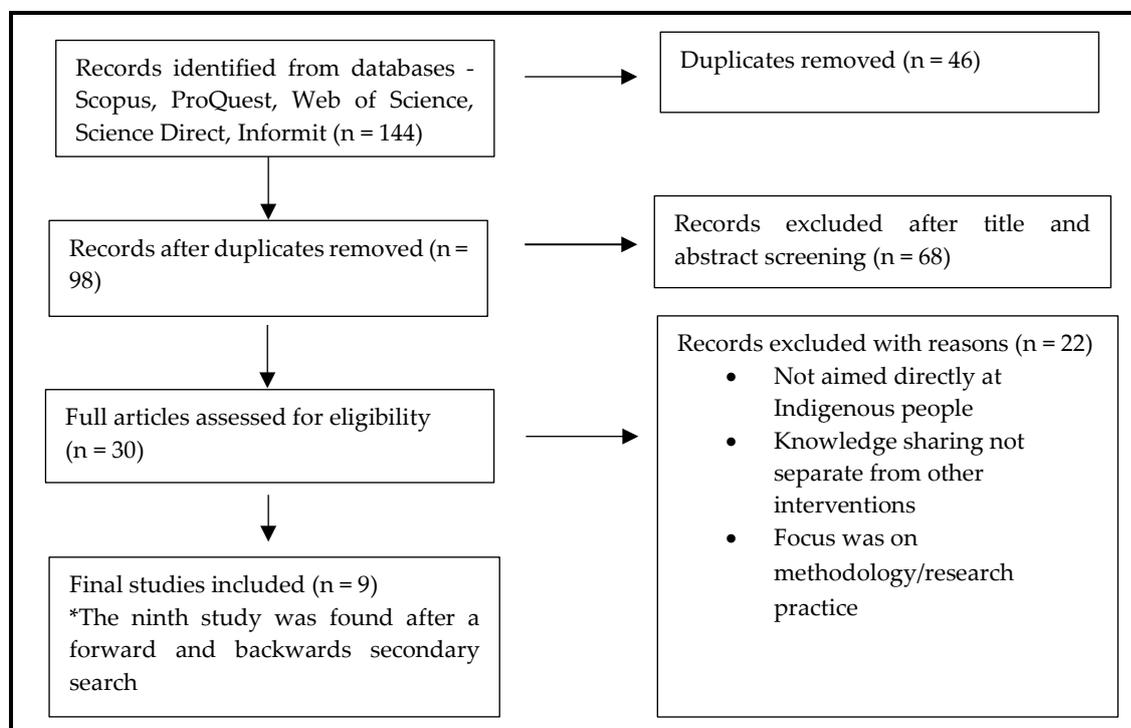


Figure 1. Prisma Flowchart of Search Process

The abstract screening process resulted in 30 studies being selected. At least two members of the team then checked the full text of the articles against the exclusion criteria and other team members were consulted until a sample of eight studies remained, including one review and seven primary studies. Forward and backward secondary searching was carried out to check for further relevant articles. As a result of this step, the review by Brusse et al. (2014) was included as it was cited by Adams et al. (2017). Thus, the final sample included two reviews and seven primary studies. Figure 1 above illustrates the search process in a PRISMA flowchart.

3.5 Data Extraction

The studies extracted are first presented at an overview level to show the nature and extent of the studies in general (see Kuckertz & Block, 2021). The data extracted (charted) for primary studies are then further analysed using a schema based on the Context-Interventions-Mechanisms-Outcome (CIMO) Framework (Denyer et al., 2008). The CIMO framework is used in fields including information systems, management, and organisation studies to present practice-based evidence (e.g., Suchowerska et al., 2020) and as a base for design principles (see Boucharas et al., 2010).

4 Results

4.1 Overview of Included Studies

The search process identified a sample of nine articles that were published between 2014 and 2021, including two review studies and seven primary studies. Table 2 gives an overview of the review studies selected and Table 3 of the primary studies. Further analysis of the primary studies is provided in the following section.

The Brusse et al. (2014) review concluded that although social media technologies have the capacity to address health promotion in Indigenous communities, the evidence for their capacity to achieve results is limited. The authors recognise that one issue that may help explain the lack of evidence for project results could be that the nature of the technologies used (social media and mobile apps) do not allow for clear outcomes or implementation measures. They suggested that health promotion organisations need to gain a more thorough understanding of technologies, their users and their use.

The Olsen et al. (2014) review analysed their sample of studies for developing a response to the Hepatitis B virus in terms of five priority areas: building partnerships and strengthening community action, diagnosis and screening, preventing transmission, clinical management and health maintenance and support. The last of these priority areas was highlighted as a concern for knowledge sharing. The authors concluded that there was a need “to develop culturally appropriate health promotion interventions for people with CHB [chronic hepatitis B] and their families to strengthen health literacy” (p. 140). This review did not report any studies where outcomes were reported from a knowledge-sharing intervention.

The seven primary studies were published between 2015 and 2021. A variety of study methods were used: four were mixed methods (Adams et al., 2017; Berends & Halliday, 2018; Fagan et al., 2015; Thomas et al., 2010), two were mainly qualitative (Cox et al., 2021; Mitchell et al., 2021) and one was a confessional-type account with rich data (Welsh, 2018). Four of the seven studies employed external independent analyses, in that they were undertaken by people who were at least some distance from the intervention being evaluated (Berends & Halliday, 2018; Cox et al., 2021; Fagan et al., 2015; Thomas et al., 2010).

This overview shows that a number of studies appearing since 2014 included some evaluation of outcomes for knowledge-sharing interventions with Indigenous communities, although the methods varied. The two relevant review articles from 2014 did not find any relevant primary studies with an evaluation of outcomes. One possible conclusion is that this area of study is becoming more mature, as there is more attention to the evaluation of outcomes.

| Study Details/Aim | Discipline/Region | Type of Study | Indicative Results |
|---|--|--|--|
| Brusse, et al. (2014). Social media and mobile apps for health promotion in Australian Indigenous populations: scoping review. <i>Journal of Medical Internet Research</i> , 16(12), e3614. | | | |
| To study social media and mobile apps used in health promotion: (1) evidence worldwide, (2) their use in Australian Indigenous communities. | Health/ (1) World-wide (2) Australia | 1) Scoping review of peer-reviewed evidence, (2) review of relevant projects in Australia. | 1) Found seven reviews, 17 primary studies, (2) found five social media projects, four relevant mobile phone apps. No publicly available evaluation for any of these projects. |
| Olsen, et al. (2014). Responding to Australia's National Hepatitis B Strategy 2010-13: Gaps in knowledge and practice in relation to Indigenous Australians. <i>Australian Journal of Primary Health</i> , 20(2), 134-142 | | | |
| "Map the main sources and types of evidence available on the epidemiology of HBV [hepatitis B virus] as well as public health responses" 2001-2013 for Indigenous Australians (p. 134). | Health/ Australia | Scoping Review | "Significant gaps in knowledge and practice were identified in relation to each of the five National Hepatitis B Strategy priority action areas" (p. 134). |

Table 2. Review Studies

| Study Details/Aim | Discipline/Region | Type of Evaluation (internal/ external) | Indicative Results |
|---|--|---|---|
| 1) Adams et al. (2017). How's your sugar? Evaluation of a website for Aboriginal people with diabetes. <i>JMIR Diabetes</i> , 2(1) | | | |
| "to describe the construction and utilization of the website "How's Your Sugar," a website for Aboriginal people with type 2 diabetes" (p. 1). | Health/ all Victoria | Mixed method: Content analysis of documents, Google analytics, survey. (internal) | "Inclusion of Aboriginal ways of knowing and being alongside other theoretical and evidence models in Web design is possible. Aboriginal people do utilize Web-based health promotion" (p. 1). |
| 2) Berends et al. (2018). Capacity building and social marketing promotes healthy lifestyle behaviour in an Australian Aboriginal community. <i>Australian Journal of Rural Health</i> , 26(4), 279-283 | | | |
| To describe a social marketing initiative targeting a regional Aboriginal Australian community and to determine whether a specific campaign produced positive outcomes (p. 280). | Healthy lifestyle behaviour/ Regional Victoria | Mixed method: interviews, Facebook insights, survey. (external) | "Social marketing engaged the community and prompted positive behaviour change" (p. 279) |
| 3) Cox et al. (2021). Closing the gap in Aboriginal health disparities: Is there a place for Elders in the neoliberal agenda? <i>Australian Health Review</i> , 46(2), 173-177. | | | |
| To examine how "Elders consider the Closing the Gap programs for improving community health outcomes" (p. 173) | Community health/ remote community in Tasmania | Participatory action research, thematic analysis of individual interviews and yarning circles. (external) | "The Closing the Gap programs were seen by Elders as having instrumental value for addressing Aboriginal community disadvantage. However, the programs also represented a source of ongoing dependency that threatened to undermine the community's autonomy, self-determination and cultural foundations" (p. 173) |

| | | | |
|---|---|---|---|
| 4) Fagan et al. (2015). Successes in sexual health communications development, programmatic implementation and evaluation in the Torres Strait region 2006 to 2012. <i>Australian and New Zealand Journal of Public Health</i> , 39(3), 270–276 | | | |
| “To evaluate the Indigenous sexual health promotion program in the Torres Strait 2006–2012 that culminated in an education-entertainment radio drama, Kasa Por Yarn (KPY)” (p. 270) | Health/ Remote | Mixed method: prior publications, document review, survey. (external) | “There was improvement in sexual health knowledge scores ($p < 0.00$) in the 15–19-year-old Torres Strait Islander population between 2007 and 2012. The 2012 15–24-year-old population exposed to KPY had higher sexual health knowledge scores compared with those unexposed ($p = 0.02$)” (p. 270) |
| 5) Mitchell et al. (2021). Using community-led development to build health communication about rheumatic heart disease in Aboriginal children: A developmental evaluation. <i>Australian and New Zealand Journal of Public Health</i> , 45(3), 212–219. | | | |
| To address low understanding by families of acute rheumatic fever (ARF) and rheumatic heart disease suffered by children (RHD) in remote NT through health communication and to increase opportunities for prevention through awareness. | Health/ remote | Analysis of qualitative data collected throughout process. (internal) | “Some children showed new responses and attitudes to skin infections and their RHD treatment. Language teachers used natural social networks to disseminate new information. A community interagency collaboration working to prevent RHD commenced” (p. 212). |
| 6) Thomas et al. (2010). Lessons for Aboriginal tobacco control in remote communities: an evaluation of the Northern Territory ‘Tobacco Project’. <i>Australian and New Zealand Journal of Public Health</i> , 34(1), 45–49. | | | |
| “To evaluate a Northern Territory (NT) government-led pilot ‘Tobacco Project’ in six remote communities” (p. 45). Some activities included were not knowledge transfer: e.g. changing stock in stores. | Health/ remote | Surveys of staff, interviews. Observation of intervention, review of project documents, sales monitoring of tobacco consumption. (external) | “More tobacco control activity was consistently associated with a greater reduction in tobacco consumption” (pp. 45). |
| 7) Welsh, B. (2018). The Hepatitis C trilogy: A case for Indigenous theatre as a contemporary manifestation of traditional healing business. <i>Australasian Drama Studies</i> , 73, 20–41. | | | |
| An Indigenous theatre company, <i>Ilbijerri</i> , presented shows focused on the treatment of hepatitis C within the Indigenous community | Health/ three communities in Victoria, including a prison | Rehearsal observation/ yarning circles (internal) | Concluded that the theatre work was a contemporary form of healing ritual. |

Table 3. Primary Studies

4.2 Charting

Analysis of the primary studies was undertaken using a charting method to address our research questions. Table A1 in the Appendix shows the data charted for one study as an example against the CIMO-based schema. The detailed schema was developed by two of the researchers after the study of four articles, with a third researcher helping resolve differences (following Peters et al., 2020). A spreadsheet showing the charting of all primary studies in the sample will be made available online.

4.3 Nature of Interventions Developed

Tables 2 and 3 show that the two reviews and seven primary studies identified were all related to health. One study was at the state level (Victoria), one was regional, one was conducted with three communities within a state and four with remote communities. The different aspects of health addressed were type 2 diabetes, healthy lifestyles, community health, sexual health, rheumatic heart disease, tobacco consumption and hepatitis C.

From Table 3, it can be seen that the primary interventions reported were a website, a community Facebook Page, Closing the Gap programs, an education-entertainment radio drama and other communication strategies, a curriculum for rheumatic heart disease, a tobacco control project and an Indigenous theatre performance.

All studies reported positive outcomes. Only one study also reported negative outcomes, namely Cox et al. (2021) in their independent analysis of the Closing the Gap program with a small group of Elders in Tasmania. The Elders felt the program threatened their community's autonomy and cultural foundations, despite yielding results of instrumental value.

To address the nature of the interventions developed, it is of interest to look at the development approach for the intervention and the "mechanisms" employed to achieve desired outcomes. Table 4 gives a short account of the interventions.

| |
|--|
| <p>1) Intervention: The <i>How's your Sugar</i> website for Aboriginal People with type 2 diabetes in northern Australia and Torres Straits islands (Adams et al., 2017)</p> <p>Approach: Collaborative, mix of Indigenous and non-Indigenous team members. An initial review of other websites targeted at Indigenous people informed the design. Consultations with Aboriginal people with diabetes and Aboriginal health workers helped to determine what would be appealing to the target audience - specifying requirements such as entertainment and humour, storytelling, and Aboriginal health workers.</p> <p>Mechanisms and tools: The website had an opening page with a graphic depicting a kitchen with four peers around a table. Visitors could navigate around the kitchen and click to link to appropriate resources, including videos and a nutrition game. Fridge magnets were used for promotion.</p> |
| <p>2) Intervention: <i>Deadly Sports</i> Facebook page in Gippsland (reported on by Berends & Halliday, 2018)</p> <p>Approach: Partnership between the project and local stakeholders (note the Berends et al. study is mainly concerned with evaluation).</p> <p>Mechanisms and tools: Facebook page with calendar of local events, healthy lifestyle information, regular posts of local people engaged in healthy activities including videos, newsletter. The immediacy of the media included was seen as important to engagement and promotion.</p> |
| <p>3) Intervention: Australian Government Closing the Gap programs (reported on by Cox et al., 2021)</p> <p>Approach: The authors say that the Closing the Gap programs lack an acknowledgement that policy-making is a value-laden process "reflecting a suite of dominant Western neoliberal assumptions" (p. 173).</p> <p>Mechanisms and tools: This study was primarily evaluation and did not provide details of the Closing the Gap programs. The eight Elders interviewed suggested three possible approaches to ensure the community's cultural foundations were not undermined: 1) embedding cultural values in the programs; 2) separating the programs from cultural values; 3) ensuring culture is kept as core business.</p> |
| <p>4) Intervention: Sexual health promotion activities 2006-2012 in far North Queensland (reported on by Fagan et al., 2015)</p> <p>Approach: Partnership between public health unit, district health service and communities.</p> <p>Mechanisms and tools: Numerous promotion activities including school-based health education, arts-based strategies and a radio drama <i>Kasa Por Yarn</i> as well as communication activities through SMS, information nights, newspaper and radio announcements, mass media campaign including TV, website and posters, and a HipHop project.</p> |
| <p>5) Intervention: Curriculum for Rheumatic Heart Disease (RHD) lessons in northern Australia (Mitchell et al., 2021)</p> |

| |
|--|
| <p>Approach: The multidisciplinary team included Aboriginal members. The development process included “both-ways learning”, with careful iterative discussions leading to the development of the “story-line”, a narrative for information dissemination. Exposure to RHD data was a catalyst. Analysis showed adherence to the principles of community-led development in the work.</p> <p>Mechanisms and tools: Conceptual and language issues meant meaning-based translation methods. Indigenous knowledge and metaphors were used (e.g white blood cells as warriors). Information posters in four languages were produced for the community.</p> |
| <p>6) Intervention: Tobacco Project in six remote communities in the Northern Territory 2007-2008 (reported on by Thomas et al., 2010)</p> <p>Approach: Communities were asked to prioritize and plan activities for which a Northern Territory government department could provide support. Activities varied across the six communities, with examples “of both successful and poor collaboration and conflict between project partners” (p. 48).</p> <p>Mechanisms and tools: Most of the project’s efforts involved community education and awareness raising, but also included activities such as cessation of cigarette sales at a supermarket and establishment of smoke-free areas. This study was primarily for evaluation and did not provide detailed accounts of the project’s activities.</p> |
| <p>7) Intervention: Series of theatre performances <i>Viral</i> on Hepatitis B in Victoria (Welsh, 2018)</p> <p>Approach: Solely Indigenous members. When making <i>Viral</i>, the first exercise that theatre makers were asked to do was to write down what they knew about hepatitis C. The development process began with gum leaves brought in to sweep the space and where the cast and crew sat around the freshly made stage.</p> <p>Mechanisms and tools: The performances included drama, dance, story and humour. The rehearsal process and the final production of <i>Viral</i> provided a relationally accountable and responsible portrayal of the lives, experiences and challenges for Indigenous people living with hepatitis C. Yarning circles afterwards discussed the performance.</p> |

Table 4. Intervention Design and Development

4.4 Indigenous ways of knowing

Our second research question asked how interventions take account of Indigenous ways of knowing, being and doing, if at all. Four of the seven studies in Table 4 gave detailed accounts of the development of an intervention that explicitly acknowledged Indigenous ways of knowing, being and doing. These studies noted consultation with Aboriginal people and inclusion of Aboriginal self-determination pathways (Adams et al., 2017); use of culturally appropriate storyline and radio dramas (Fagan et al., 2015); language-based and culturally relevant health communication centring on Indigenous epistemologies (Mitchell et al., 2021); and storytelling: culturally safe and partially decolonised rehearsal space, respectful collaborative practice and responsibly drawing from lived experiences and community voices (Welsh, 2018).

Three other studies in Table 4 focused on evaluation and had relatively little detail on the intervention itself. Berends and Halliday (2018) noted that the local community was involved in social media content production and dissemination. Cox et al. (2021) did not describe the Closing the Gap programs evaluated in detail but used yarning in their evaluation. These authors ascribed problems seen in the Gap programs to inadequate recognition in the neoliberal governmental approach to Aboriginal cultural values, particularly in respect of the role of Elders, who “are recognised cultural custodians of social, kinship, ecological, language and spiritual knowledge systems developed over millennia” (p. 174). Thomas et al. (2010) noted that storytelling was used to reinforce anti-tobacco messages.

A number of the interventions included performative means to enable knowledge sharing. Some studies showed how this type of work arose during the development processes, without

necessarily being based on explicit theoretical knowledge of Indigenous knowledge-sharing practices. For example, the development of the How's Your Sugar website (Adams et al., 2017) included an initial review of other websites aimed at diabetes management. The team found that these websites commonly featured static materials, such as images, texts and downloadable PDFs. They were written from the perspective of a non-Aboriginal health professional as an expert addressing a client. A team member commented: "Who do they think they are talking to? It's like they stuck some Aboriginal artwork on it and said 'that'll do', it's patronizing" (p. 4). The website that resulted from this project had an opening page of a kitchen with four peers, a familiar informal space for yarning, and visitors could navigate around this space. Each peer had a link to a short video about how they managed their own diabetes.

The curriculum developed in the rheumatic heart disease program (Mitchell et al., 2021) developed analogies and metaphors in a storyline that included showing white blood cells defending the body as a traditional war party defending the territory against invading outsiders. School students produced additional materials such as T-shirts with graphics depicting a white blood cell fighting a bad germ and a fish trap depicting how white blood cells know good germs from bad.

A number of the studies mentioned the importance of making activities fun and including humour. For example, the production of the Viral theatre performances deployed humour through the depiction of three characters representing documentary filmmakers being presented as "very naïve and very, very white" (Welsh, 2018, p. 28). The Indigenous producers included these characters as comic relief. They were meant to illustrate what happens when non-Indigenous people are given a small amount of cultural safety training and then start using inappropriate terms.

In sum, six of the seven primary studies reported only positive outcomes and all of these showed some recognition of Indigenous ways of knowing, doing and being in some way, including storytelling, drama, dance, graphic artwork and humour. These studies also showed, where detail was available, that Indigenous people were involved in development activities mostly in appropriate ways, with terms used such as collaborative (Adams et al., 2017), partnership (Berends & Halliday, 2018; Fagan et al., 2015), and solely Indigenous development (Welsh, 2018).

4.5 Use of ICT in Interventions

Our third research question asked how ICT was involved in these interventions, if at all.

Only two of the seven studies had interventions that were primarily ICT-based, involving a website (Adams et al., 2017) and a Facebook page (Berends & Halliday, 2018). Other studies incorporated ICT as a component of the intervention. The sexual health promotion, although mainly using a radio drama as a vehicle, also included a website (Fagan et al., 2015). The intervention to address rheumatic heart disease used data from a medical database showing the high incidence of the disease as a catalyst to initiate change (Mitchell et al., 2021).

5 Discussion and Conclusions

Our scoping review identified two review articles and seven primary studies relevant to our research objectives, published from 2014-2021. All were in the area of health. Six of the seven studies recognised Indigenous ways of knowing, being and doing to some extent and all

reported some positive outcomes. The seventh study attributed some negative outcomes to a lack of respect for Indigenous cultural values (Cox et al., 2021).

Unlike earlier reviews (Brusse et al., 2014; Olsen et al., 2014), the final sample of primary studies located in our review all had some form of evaluation and four were evaluations undertaken independently of the primary development project. This finding may indicate a growing maturity in the field and more attention being paid to the importance of evidence for interventions to show what works under which circumstances. On the other hand, only seven studies were found, which appears a relatively small number. The selection process for the review excluded a number of studies that were located with our search string and described interventions, particularly in relation to the methodology that was used but did not describe outcomes to any extent. This observation indicates there is still room for improvement in building an evidence base.

It is not expected that scoping reviews, which address a broad question and include studies with varying methods of gathering evidence, can provide definitive guidance for the efficacy of different strategies. Nevertheless, our study has shown that for seven studies where results were evaluated, the six that reported only positive outcomes had all given consideration to Indigenous ways of knowing to some extent. This observation is congruent with the arguments reviewed in our introduction that propose that attention to Indigenous ways of knowing and doing is vital in projects with Indigenous communities.

The seven studies also show the broad range of stakeholders who can be involved in interventions, including Indigenous people, government departments, community leaders, and local health organizations. The impetus for the interventions varied. In one case the project originated in an Indigenous theatre company (Welsh, 2018), in one spontaneous emergence was observed amongst a school's Aboriginal language and culture teachers (Mitchell et al., 2021), while others were initiated by government departments (e.g. Thomas, 2010).

The detailed accounts of projects with positive outcomes provide striking examples of how verbal, visual and performative expression can be incorporated into knowledge-sharing interventions. Imagination and creativity were evident in the developmental processes. For example, Welsh (2018) documented the power of theatre to influence Indigenous audiences on issues that affect their lives, such as the trauma of living with hepatitis C. Indigenous performances that incorporate humour, dance and song – elements that have long been integral to Indigenous cultural practice – can thus be harnessed by an Indigenous creative team, or team members, to good effect. The cases provide examples of how Indigenous team members were directly responsible for elements of the design of an intervention, in ways that non-Indigenous people appear unlikely to have envisaged. For example, Websites designed from a non-Indigenous viewpoint for Indigenous people were seen as patronising and highlight the need for engaging and interactive websites, as recognized by Indigenous team members in the “How's Your Sugar” project (Adams et al., 2017). The theatre performance designed by a solely Indigenous dance company had a storyline that poked fun at “very, very white” documentary makers with only a smattering of cultural safety training (Welsh, 2018, p. 28).

It is perhaps surprising that our review located only two studies where ICT was the primary vehicle for knowledge sharing. This finding may be a result of ICT-based projects either not including an evaluation of outcomes or being left out of the peer-reviewed literature. Such a finding would be congruent with the review by Brusse et al. (2014) of social media and mobile

apps used in health promotion which found nine relevant projects that were non-peer-reviewed and had no publicly available evaluation of the projects.

Although the reporting of ICT-based interventions in our study context is limited, the two studies that do use ICT (Adams et al., 2017; Berends & Halliday, 2018) should be carefully considered by those planning ICT-based work. The non-ICT-based studies also provide interesting ideas that could be built on or adapted in future work. The oral traditions and performative aspects of design that have been incorporated could be used further in ICT-based innovations that use multimedia-based modes of communication. Our initial background review shows that Indigenous people embrace the use of digital technologies and are putting them to use in ways that enhance their cultural practices (e.g., Verran & Christie, 2007). It is critical, however, that any ICT-based interventions, particularly those primarily designed by non-Indigenous people, are designed in such a way so as to not merely reproduce Western values, but rather facilitate use amongst Indigenous communities that accords with their cultural practices (Dyson, 2004). In addition to involving Indigenous peoples in the design of such interventions, this may also entail ensuring that ICT-based interventions are mobile-friendly, facilitate easy sharing with others, and utilise multimedia forms of expression including videos, pictures and music.

Our study has some limitations. The search process was limited to academic peer-reviewed literature while governmental reports and similar documents were not searched. Thus, projects undertaken by governmental bodies and the projects reported by Fogarty et al. (2018) relating to health promotion strategies addressing gambling are not necessarily included. In addition, although the search process was performed with care, some relevant studies may have been excluded through our selection of search terms.

This study makes a valuable contribution to the body of knowledge by reviewing what is currently known about interventions to assist in knowledge sharing in Australian Indigenous communities where an evaluation of outcomes has occurred. It supports the view that it is vital to acknowledge and utilise Indigenous ways of knowing in such interventions. The cases reviewed also suggest that Indigenous team members are essential for creative aspects of interventions that are appropriate for an Indigenous audience. The study reveals few accounts of ICT-based interventions with empirical evaluation but the case studies reviewed, both ICT and non-ICT based, offer rich detail to inform future design and development work.

Although this study has focussed on interventions for knowledge sharing with Australian Indigenous people, it should have relevance more broadly. The finding concerning the need to utilize Indigenous ways of knowing in the Australian context can be related to the methods proposed for research with other Indigenous people worldwide, such as Wilson's (2008) framework of relational accountability that was developed in both Australia and Canada (referenced in the Indigenous theatre company study (Welsh, 2018)).

The study also indicates directions for future research. All the studies selected for the review were in health-related disciplines – an unexpected finding. This highlights the need for similar studies in other areas such as the other problem areas identified in the Closing the Gap initiative, including education, vocational training and services provision. Sustainability and environmental management are other potential areas for further work in Australia and are being researched internationally (e.g. Tschirhart et al., 2016). While some projects are occurring in the non-health areas, they appear to lack the level of maturity that has been reached in reporting outcomes, as found in health fields. Indigenous Australians continue to face a range

of structural and institutional challenges that affect their well-being. Much more needs to be done to address these challenges in ways that incorporate Indigenous ways of knowing, being and doing so as to bring about meaningful change for groups experiencing substantial disadvantages.

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Apenndix A

Table A1 Example Showing Charting for One Primary Study

| Charting Schema | Data extracted* |
|--|---|
| General Information | |
| - Title | Mitchell, A. G., Diddo, J., James, A. D., Guraylayla, L., Jinmarabynana, C., Carter, A., ... & Francis, J. R. (2021). Using community-led development to build health communication about rheumatic heart disease in Aboriginal children: a developmental evaluation. <i>Australian and New Zealand Journal of Public Health</i> , 45(3), 212-219. |
| - Year of publication | 2021 |
| - Discipline area | Health |
| - Type of study (primary or non-primary) | Primary |
| - Funding/sponsor body | Australian Government under the Strong Communities for Children Program |
| Context | |
| - Aim of the study/problem addressed | Health - rheumatic heart disease |
| - State/region of Australia (remote/reserve, regional, urban) | Remote community town, NT |
| - Underpinning theory (if any)/policy/perspective | Principles of community-led development |
| - Specified Indigenous ways of knowing, being and doing (if any) | Yes - "cultural ways of learning" |
| Intervention (project/activity) | |
| - Nature/type (overarching) | Curriculum for Rheumatic Heart Disease lessons |
| - ICT-based (yes/no) | No |
| - Who was involved in development (Indigenous, non-Indigenous, mix) | Multidisciplinary team including Aboriginal members |
| - Beneficiaries (target audience) | Every school-aged child in remote community |
| Mechanisms (Process Steps) | |
| - How was the intervention/ project/ activity done (i.e., the design, development, implementation process) | (i) "Both-ways learning" with careful iterative discussions led to development of the "story-line", a narrative for information dissemination [story telling] (ii) exposure to RHD data was a catalyst; (iii) conceptual and language issues meant meaning-based translation methods; (iv) Indigenous knowledge and metaphors used (e.g white blood cells as warriors) [metaphor/analogy] |

| | |
|--|--|
| - What artifacts/tools were involved/produced | School children produced t-shirts with graphics, information posters |
| - Did any of the artifacts used/produced involve ICT | Yes - Data from RHD database |
| Outcomes | |
| - Positive outcomes | Some children showed new responses and attitudes to skin infections and RHD treatment. Teachers used natural social networks to disseminate new information. Community interagency collaboration to prevent RHD commenced. |
| - Negative outcomes | None noted |
| Evaluation | |
| - Evaluation methods used | Developmental evaluation with qualitative data gathered throughout project |
| - Who did the evaluation (internal/external) | Internal |

* Secondary coding is shown in square brackets

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