2018

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Abstract

This research is situated in the Ngemba community which includes the township known as Brewarrina. It is located approximately 900 kms north west of Sydney and classified 'Very Remote Australia'. Brewarrina's recorded Aboriginal population in 2016 was 71.09% contrasted with the total Indigenous Australian population being 2.8%. The Australian Government have identified Brewarrina in the 'Digital Divide' category.

Closing the gap on socio-economic disadvantage and the digital divide is directly related to economic development and national priorities include Aboriginal peoples' employment as an identified target under the banner of the 'Close the Gap' initiative. The Australian government stated the national broadband network (NBN) initiative and ICTs would assist in achieving such priorities. Despite such strategies and initiatives, direct action has yet to be realised. This raises opportunities for targeted networking interactions within and beyond community, offering innovative approaches to countering these priorities.

This research will implement and verify an innovative model that facilitates community digital entrepreneurship. The model proposes several practical applications, including community members' ability to promote community entrepreneurship and community members' skills development.

Keywords
Indigenous entrepreneurship, Community Informatics, Digital platform, Aboriginal Australian, Indigenist research

1 Introduction

In Australia, national priorities include Aboriginal peoples' employment as an identified target under the banner of the 'Close the Gap' initiative (DPMC, 2018). Entrepreneurship has been recognised as an engine which works as an economic and social catalyst of economic development in many countries and considered as essential step for competitive landscape (Sciascia & De Vita 2004; Furtunato & Alter 2015). Community culture and resources within a certain social structure could be an impactful antecedent to community entrepreneurship for the combined benefit of community and its members and may have potentials to support small community enterprises (Furtunato & Alter 2015).

The research discussed here is to co-design and verify a community digital entrepreneurial platform. The community entrepreneurial platform is a socio-technical space where community will come together to develop and curate resources required for entrepreneurial processes. Such community based enterprises are rare and the research is to develop adaptive IT support for such concepts. The term 'community entrepreneurship' is used as this platform is envisaged to promote enterprise development and economic growth in the society by exploiting the available resources across the community as well as monitoring the progress in the digital skills of its members during the process.

The platform proposes several practical applications, including community members' ability to:

- promote existing digital skills with a potential to identify gaps in skills and self-identify skill development needs;
- enhance cultural, social and professional interests in a public context; and
- collect artefacts and knowledges for use in community-based start-ups.

This project seeks to work with the Ngemba community of Brewarrina, far north-west New South Wales (NSW), Australia, who have minimal access to such support and align this IT support with every day activities of local peoples, for example, the fisheries, art and other cultural activities. This project considers activities related to the fisheries as a proof of concept application. The reliance of community on fish in the area, and the use of the fisheries to feed large community gatherings, provides an opportunity to use information and communication technology (ICT) for community entrepreneurship.

Community participation and community owned and led research facilitates a deeply collaborative approach where community and researchers are both active participants in the research process and user centric design. We are using a participatory design method to develop an initial prototype of a digital entrepreneurial platform, with consultations with Elders and senior community members.

This paper provides the background to the research, the community and the proposed enterprise platform, and then discusses the initial concept prototype to explain the design of this novel system.

2 Background

2.1 Brewarrina Community

The town of Brewarrina is situated on the southern banks of the Barwon River with related community hubs. Remoteness Areas divide Australia into 5 classes of remoteness based on a measure of relative access to services. The Australian Government has classified Brewarrina as 'very remote Australia'. Ngemba peoples are the traditional custodians of the lands in and around Brewarrina.

Brewarrina's population today consists of up to 20 different first nations language groups. The community embraces the diversity of these many cultures (AANSW, 2011) Ngemba peoples and the many nations residing in Brewarrina are a proud people and remain strong in Country and culture. Ceremony still occurs and while not all community participate in traditional ceremony, contemporary ceremony such as weddings, funerals, festive and spiritual holidays, festivals and sporting events play a significant part of Aboriginal peoples culture on Ngemba country today.

The latest National Aboriginal and Torres Strait Islander Social Survey, 2014-15 (ABS, 2015: 4714.0) for Aboriginal and Torres Strait Islander peoples aged 15 years and over, just over one in five (21.5%) were enrolled in formal study; and less than half (46.0%) were employed — 27.7% working full-time and 18.3% working part-time. Over half the population's income is lower than $600, contrasted with the total Australian average weekly income being $1,171. Socio-political and economic disadvantage reflected by ABS statistics identifies Brewarrina as the most socio-economic disadvantaged community in New South Wales (ABS, 2016). To understand the social determinants, of the 281 dwellings in Brewarrina, 116 have internet access installed in the dwelling and residents responded non-dwelling access for 101 dwellings, while residents did not state for the remaining 22 dwellings (ABS, 2016; see area on map).

2.2 Fisheries in Brewarrina

Since creation time[1] these lands, fisheries and rivers have been known to Ngemba and neighbouring nations as a gathering place and continual food source to over 5,000 peoples at any one time. Creation stories handed down through generations say Baiame's Ngunnhu[2], the fish traps or fisheries, were built to sustain the many neighbouring nations and to learn to care for Country (Steadman, 2010). Fishing is a staple food for Aboriginal peoples. The traditional eating fish is the Golden Perch, known locally as 'Yellow Belly' and Murray Cod. While fishing lines are the contemporary practice, most Aboriginal youth catch Yellow Belly and Murray Cod using a method known as 'tree guarding' in the water between the weir and the fish traps. Depending on the water levels, fish are still caught in fish traps. Kindle and Lansdowne (2012) note the importance of incorporating the traditional innovation of the people, and their specific worldview into enterprise development, and the significance of Baiame's Ngunnhu is the reason for the initial project focus on fisheries.

2.3 ICT in Brewarrina

Brewarrina Central School enrolment in 2017 was 145 students of which 97% are Aboriginal, and the Index of Community Socio-Educational Advantage (ICSEA) was 675 (ACARA, 2017). ICSEA provides an indication of the socio-educational backgrounds of students on a scale of 0 - 1200. This means when the ICSEA value is lower, the level of educational advantage of students who attend this school is lower. This also corroborated with the National Assessment Program – Literacy and Numeracy (NAPLAN) results, which indicates 85% of students in the lowest quarter, 11% in the bottom middle quarter, 2% in the top middle quarter and 1% in the top quarter. This compares with 25% nationally in each quarter (NAPLAN 2017).

It is apparent that the students in the school are disadvantaged and have not performed well. In contrast to this, empirical research shows that the uptake of social media by Aboriginal peoples, particularly on mobile phones, is extensive. 51% of Aboriginal people in very remote Australia now access Facebook regularly (McNair Ingenuity Research Institute reported on SBS, 2014).

3 Literature Review

In accordance with Indigenist research principles, this research is self-determining in that it highlights the power of Aboriginal peoples and exposes the worldviews Ngemba peoples represent (Smith, 1992). The resilience of Ngemba peoples and the rights to maintain, 'express and live culture in all its diversity' is identified and deemed paramount in this research. This is in contradiction to the alternative, which often focuses on the disadvantage experienced by Aboriginal Australian peoples because of colonisation (Moreton-Robinson, 1998). This research approach liberates Ngemba knowledge perspectives, voices and relatedness (Hardy, Bidwell, Cadet-James, & Atkinson, 2008; K. L. Martin, 2003; Nakata, 2002). It is this relatedness between people, knowledges and the natural world (K. Martin, 2003; Walker, 2001) that informs the conceptual framework for participatory research.

Indigenist theories are emancipatory in intent. Indigenist research and critical theories in research focus on the political dimensions of research. This acknowledges and mitigates the dominating effects of 'traditional' western knowledge systems. This approach enables a broader focus derived from every day lived realities of Ngemba community, Country and culture. Ultimately, this ensures self-determining pathways toward a platform that contributes to and enhances the design of western designed ICT systems for Ngemba community. Self-determination in the research space is a requirement not only set out by national and international guidelines prescribed by UNESCO (2006), and NHMRC (2007). but this is assumed by Aboriginal peoples on Country.

Aboriginal worldviews include complex social and spiritual systems of relatedness and connection to Country. It is these complex knowledge systems, which consider Indigenous science as founded on the philosophies, knowledges and histories underpinned by cultural practices and beliefs. Further, Aboriginal worldviews embody relatedness and all things being related (Graham, 1999). Theories of relationship were later named relatedness theory by Martin (2008, p. 69) who concurs with Graham (1999) and posits relatedness occurs across contexts and is defined as: '… the set conditions, processes

[1] Western Science, verifies the Aboriginal Creation time as well over 50,000 years ago and specific DNA groups have remained in the same area of Australia for at least this time (Tobler et al, 2017).

[2] Aboriginal fish traps and fisheries on the Barwon river that have sustained Aboriginal peoples Country and Cultural activities for over thousands of years

and practices that occur amongst and between the creators and Ancestors; the *Spirits;* the Filters and the Entities'.

Rigney (1997) defines Indigenist research as being informed by three fundamental and interrelated principles: 'Resistance as the emancipatory imperative; Political Integrity; and Privileging Indigenous voices'. As an important part of this engagement of Aboriginal people is the work of Participatory Design. We note that many issues commonly addressed in co-design, have an even more significant impact for Aboriginal users. For example, designing for unbalanced power, problems of trust, development of relations with the users, and the design workshops will be "limited by recognizing how power relations between systems of information exchange can undermine certain values and logics" (Winschiers-Theophilus et al, 2012). The disparity of culture between the two groups: users and developers; often leads to the failure to share vital information relating to a project. This might be deliberately from fear of misuse of the information shared, or due to not understanding the relevance to the other parties of particular aspects of the process of cross-cultural negotiations.

Zaman & Winschiers-Theophilus (2015) showed how the different community groups will provide quite a different perspective on community knowledge sharing, so a range of choices needs to be heard, and Winschiers-Theophilus et al. (2012) acknowledge the need for "reframing of relationships between cultural contexts and meaning in design". In our work we used a collaborative and two-way educational approach to develop localised processes, so the community will see a responsibility for the external developers learning, since speakers will often alter information and control its access according to their knowledge about the listener (Winschiers-Theophilus et al, 2012).

4 Research Approach

Embedded in Indigenist approaches to research (Rigney 1997; Rigney 2006) the participatory design method will be extended to facilitate a community led, community owned and community participation in all levels of design, including collaboration between Community and non-Community designers.

4.1 Method: Participatory design

One of the authors of this research is from Brewarrina community. This will facilitate community discussions. From there we will hold workshops using participatory design model to co-design and co-develop the mobile app and digital entrepreneurial platform. This will include, for example, consideration of activities, tasks within each activity and digital skill alignment.

The aim is to integrate learning with long-term participatory design (Schuler & Namioka, 1993; Spinuzzi, 2005): Participatory design involves mutual learning between both users and designers, where users participate in and learn from the design process and the collaborative development of user requirements and practices and possible technology solutions. Additionally, the researchers propose that a pathway will emerge, which sustains the participatory design process after non-community designers depart (Bodker, 1996; Kensing et al, 1998).

4.2 Phase 1: Community

This part of the design will initiate discussions about the research and will include trust building. It includes running the co-design and co-development workshops, where community and researchers participate and the knowledge sharing and design phases are carried out with reflexivity; negotiations around intellectual property and/or payment of shared knowledges will be included and discussions on technology needs (Spinuzzi, 2005). The researchers will attend regular community meetings where:

- community members and researchers facilitate meetings, so the process is relevant to community members' activities
- non-community members and researchers have the opportunity to listen to and document community priorities.

By embedding community meetings into the design process, the researchers learn from community to design with community and ensure that community benefits and tangible outcomes are realised (Irani et al, 2010).

4.3 Phase 2: Sharing Knowledges

The exploration meeting will develop standard HCI workshops using paper design as artefacts for discussion and managed by community. Community will also select who they consider suitable to participate. However external designers will recommend a range of people based on the experience at

exploration stage. Similarly, the format of these meetings, and the level of engagement of the community in the process will be established by initial discussions.

The knowledges sharing phase will include discovery of specific tasks used in activities around the fisheries. We will need to consider community oral knowledge sharing protocols and how community wish to extend this beyond community (Battiste 1998). This will include the showcasing of existing community skills in specific activities and when related knowledges are collated in one central repository for sharing there will be tools to link and share this data.

The workshops will be designed to provide scope for community to consider:

- Technology available to community and optimal technology for the application
- Software options relating to the prototyping needs, the technology and the pervasiveness and maintainability of the software system (smaller market systems)
- Interface design templates for use across different business models that may arise
- Features that suit the user needs within all business models
- Options for skill development (Kutay, 2007)

4.4 Phase 3: Designing

The process involves designers and users iteratively shaping technological artefacts to fit into the workplace envisioned in the Knowledges sharing phase. Prototyping involves one or more users and can be conducted within community if the prototype is a working system.

The community will interact with software prototypes of each design iteration and researchers will make observations of user interaction. These observations will be verified with users. Ideally there will a group of community volunteer participants to interact with each prototype iteration. As mentioned in the Community phase, we may need to obtain suitable equipment for community participants to engage with each prototype iteration, if say an ipad or some large screen device is needed.

5 Discussion

We provide here an analysis of the process of developing the initial concept prototype and relate these to the protocols developed for indigenist research.

5.1 Initial concept design

Ferreira et al. (2017) studied 4 different approaches of research in entrepreneurship: economic, psychological, institutional, and resources and capacity-based approach. Also, in all approaches enterprises are usually motivated by a dichotomy of either necessity or opportunity driven entrepreneurs (Williams & Williams 2014). In this project, we intend to foster entrepreneurship skills within the community and provide digital resources for entrepreneurs to do so within their own capabilities and interest. As fishing is one of the main activities takes place in the community, we encourage to use existing technology in mobile phones, linked to cloud services, to enhance what is already done and which has the potential for entrepreneurs to emerge.

To recognise existing strengths within community as part of an indigenist approach, the initial concept prototype is based on activities that may not be immediately relevant to enterprise but relate to existing community informal enterprises, such as fishing, caring for country and language sharing through story telling. We focus the initial concept prototype around the local feature of Brewarrina, the fish traps or Baiame's Ngunnhu. Existing fisheries activities may be extended within the app to provide financial opportunities and generate some form of income in the community. The initial prototype envisions the breadth of options for community to conceptualise and consider its relevance and relatedness to community needs and objectives.

5.2 Prototyping

The Diginet System consists of the mobile app, the online repository and a future interface to provide 'curation" of the resources into a saleable package or resource. The app as developed has a series of feature options and is developed in Android Studio since this system is a cheaper option for the community.

Hence people can login to ensure their work is recorded, then upload their images, videos or data on fish seen, or state of the river and this is location based and collected in the repository. The user can also edit to improve these artefacts.

As the next step we are taking this initial concept prototype to community to understand the skills alignment and the community focus for enterprise opportunities. Some examples of the interface include: option to locate to the community in terms of images, background and location which they can develop in the design. Also, the prototype has several features for community to use or redesign e.g., login by text or Facebook; user profile with skills practiced; data input with slider, textbox or images; moderation of comments; rating others contribution, video capture and editing.

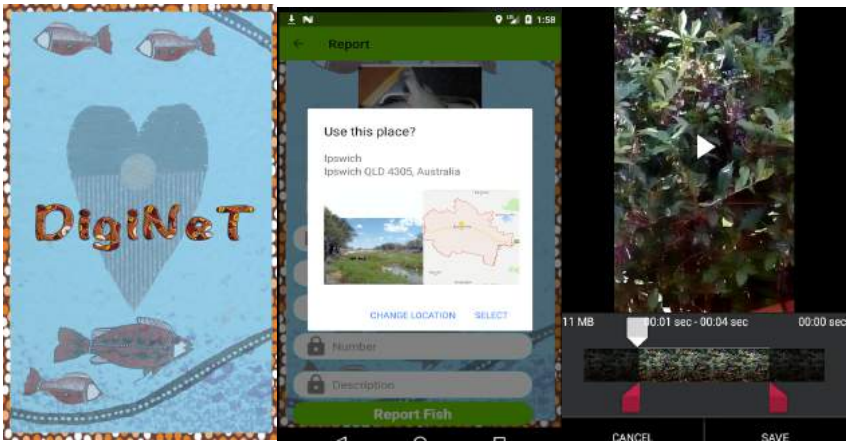

Figure 1 Snapshot of DigiNet app (login page, locating the fishing area and video editing)

The app can be edited to include suitable imagery, the sort of data they wish to store and the skills they think relevant to store on the system to provide validation of the users' digital skills. For instance, the app can record the amount and type of contribution the user makes to a recording project and users and gain credit from other users for the work they have completed, similar to the process used by LinkedIn.

6 Conclusion

This project has provided a process for engaging community in a mobile app design. Along the processes, it also sets guideline to work with community members to develop a editable template to be adapted to enterprise development. The primary aspects are to understand the standpoint of each researcher and what were the inherent assumptions in this work. Also, we were able to work from these standpoints to gather the initial opportunities for setting up community engagement, using local skills in the enterprise, and cultural knowledge sharing in the app. The workshops will build on these connections.

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Acknowledgements

This project was funded by a BlueSky Grant titled "Modelling Digital Skill Development for Aboriginal Communities" at the University of Technology Sydney in 2017.

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