



## Stronger Smarter Institute Research & Impact Footprinting

### Reading Review: “Postcolonial Computing: A Lens on Design and Development”

#### Stronger Smarter Meta-Strategy links:

1. Acknowledging, embracing and developing a positive sense of identity in schools → 2. Acknowledging and embracing Indigenous leadership → 3. High Expectations Relationships → 4. Innovative and Dynamic School Models → 5. Innovative and dynamic school staffing models

This Reading Review explores the paper *Postcolonial Computing: A Lens on Design and Development* by Irani, Vertesi, Dourish, Philip & Grinter (2010). This paper was suggested by Associate Professor Chris Lawrence from the University of Technology, Sydney. The insights and research from Irani et al. is used by Associate Professor Lawrence as a foundational framework for projects he is currently undertaking to conceptualise and establish the notion of **digital land rights** (Lawrence, Leong, Gay, Woods, & Wadley, 2017) in Australia. The paper discusses the significant challenges faced as technologies travel to new cultural contexts and western centric design processes are confronted by differing world views and theories of knowledge. Irani et al. offer postcolonial computing as a lens to reflect on current design practice and respond to global connectivity and movement and challenge the notion of the **terra nullius** education (Matthews, 2015) system discussed in a previous Stronger Smarter Institute (2017b) [reading review](#). Postcolonial computing provides a shift that aims to “reconfigure design-orientated cultural encounters” in the space of Human Computer Interaction for Development (HCI4D) (Irani et al., 2010, p. 1).

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## Language Weaves

Irani et al. (2010) originally presented this paper at the Conference on Human Factors in Computing Systems. This paper has been written for global computing designers and developers. The following language **weaves** (Davis, 2018) have been included to bridge the flow of language between the technology industry and the Institute.

Human Computer Interaction	A broader container for any design work relating to technology where a computer and human interact
Human Computer Interaction for Development (HCI4D)	The emerging discipline of design that investigates ways of appropriately designing ICT's so that they are conducive to the unique user and infrastructural requirements met in multicultural environments.
Terra nullius	The doctrine of which Australia was colonised, under power relations and inequitable relationships, terra nullius devalued, dispossessed and marginalised Indigenous people.
Digital land rights	A phrase coined by Associate Professor Chris Lawrence to encompass the importance of safe and responsive online spaces for Indigenous peoples and their communities.
SSiSTEMIK	The Stronger Smarter Institute's Indigenous Knowledges in STEM. This is the Institutes response to the STEM opportunities being provided in the 21 <sup>st</sup> century.
Indigenous Knowledge (IK)	A reference to the rich information shared on and about country through our people, by our people, for our people.

## Why the Research?

Science, Technology, Engineering and Maths (STEM) education is gaining traction across the country as a response to the global needs of the 21<sup>st</sup> century. In an increasingly complex world, students need to be able to think like STEM practitioners in a variety of known and unknown spaces more than ever before (Organisation for Economic Co-operation and Development, 2018). With seventy-five percent of the fastest growing occupations now requiring specific STEM skills and knowledges (Office of the Chief Scientist, 2014) it is integral for all students to be actively engaged and learning in STEM areas.

The Stronger Smarter Institute's Indigenous Knowledges in STEM (**SSiSTEMIK**) represents the Institute's commitment to this agenda. The Research and Impact team have a mandate to gather, collate and create specific **Indigenous Knowledge (IK)** responses to ensure Indigenous voices are leading in the STEM education space. The Institute believes **IK** at the forefront of education provides a strength-based approach that is effective in engaging all students,

especially Indigenous students. The Institute has cast an eagle eye on this paper to highlight **SSiSTEMIK** weaves worldwide.

The United Nations Conference on Trade and Development (UNCTAD, n.d.) acknowledges that Information and Communication Technologies (ICTs) provide support to achieve social and economic development. ICTs is a broad term that applies to any communication device.

As ICTs become more available across a connected world, “traditional” design practices for Human Computer Interaction (HCI), have faced a range of complex problems when designing for the “developing” world. These include but are not limited to technological cultures, digital divides, multiple stakeholders and economic disparities. This has led to the broader HCI research community becoming interested in the opportunities provided by incorporating cross-cultural design process (Irani et al., 2010).

Human Computer Interaction for Development (HCI4D) research focuses on “... how interactive products, applications, and systems can be *appropriately* designed to both address the distinctive needs of users in developing regions, and to cope with the difficult infrastructural contexts where these technologies must work” (Ho, Smyth, Kam, & Dearden, 2009, p. 1). The outcome of such research is to design new and more appropriate ICTs to improve livelihoods and freedoms (Ho et al., 2009). In an Australian context, Associate Professor Chris Lawrence of the University of Technology Sydney is leading a team of researchers on the national-scale digital project [#thismymob](#).

The [#thismymob](#) project aims to increase Indigenous participation in the design, development, operation and ownership of technologies. By applying the frameworks of postcolonial computing (Irani et al., 2010) and participatory design (Halskov, Leong, & Iversen, 2012), the project will develop an Indigenous-led Australian framework for technology research and development. The project has established the term “**digital land rights**” to encompass the importance of safe *and* responsive online spaces for Indigenous Australians and their communities. The research is being used to inform post-secondary curricula to create pathways for Indigenous developers, entrepreneurs and start-ups. (Lawrence et al., 2017). It is imperative that this ground-breaking project is supported by ensuring a pipeline of digitally capable students who are able to eventually access, develop and extend this innovative work.

The recent report Measuring Australia’s Digital Divide: Australian Digital Inclusion Index 2016 (Thomas et al., 2016) notes that there is scope to further improve digital capability in Australia. This is coupled with the Australian Curriculum, Assessment and Reporting Authority’s (ACARA) latest national sample report on the ICT literacy of Year 6 and Year 10 students highlighting the urgency of effective digital capability education in a K-12 setting (ACARA, 2018).

With this in mind, a **postcolonial computing** lens must be applied across all ICT and digital technology engagements in education spaces. Encouraging this lens within existing digital technology pedagogies and curriculum will offer culturally responsive processes that benefit all students. Irani et al. (2010) argues that including a postcolonial computing lens in design provides a point of congruence to embrace cultural differences and move into a space of new hybrid practices, a third cultural space (Bhabha, 1994; Davis & Grose, 2008). This provides Indigenous students the best opportunity to claim, create and administer their **digital land rights** now and into the future.

## What is the research?

Irani et al. (2010) use **four case studies** to illustrate how common design practices are not completely equipped with the tools for divergent cultural end users. These examples provide a context for discussion and to introduce each postcolonial computing element in HCI4D efforts; Generative models of culture, development of a historical program, uneven economic relations and cultural epistemologies.

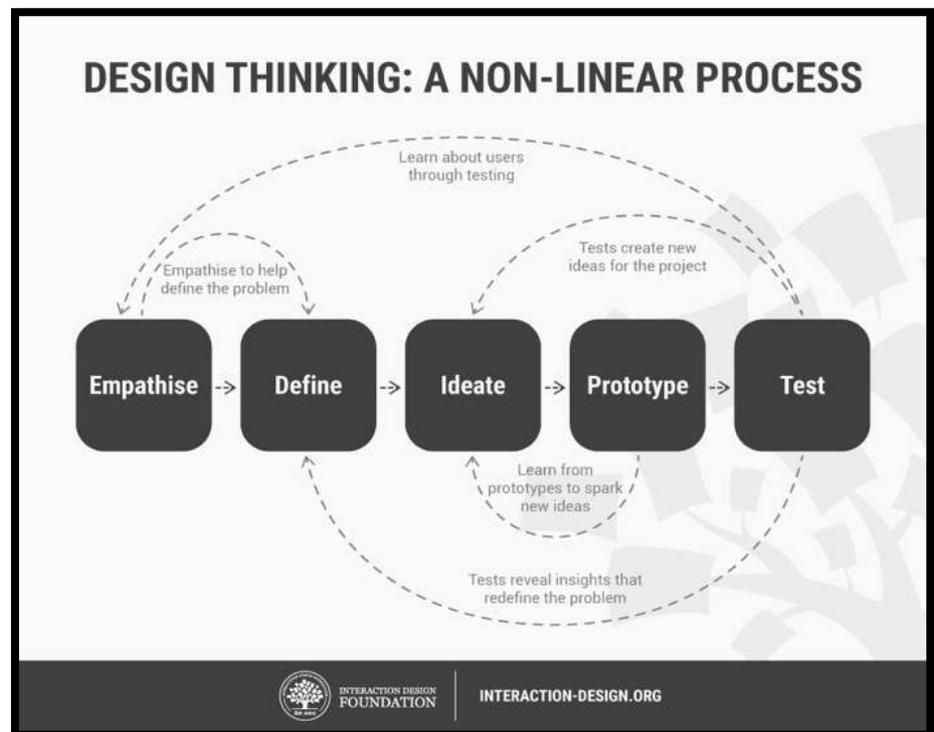


Figure 1 – Design Thinking: a non-linear process. By Teo Yu Siang and Interaction Design Foundation. Copyright license: CC BY-NC-SA 3.0

To help connect **Postcolonial Computing** with the Kindergarten-12 context, this section of the review

will situate each **case study** within the five-stage design thinking model (figure 1 above) developed by the Hasso-Plattner Institute of Design at Stanford. The 5 stages of design thinking are **Empathise, Define, Ideate, Prototype** and **Test**. A brief definition of each stage is listed below

- ▶ **Empathise** – The first stage of the design thinking process is to gain an empathetic understanding of the problem you are trying to solve. To empathise the designer is supposed to set aside their own assumptions.
- ▶ **Define** – At this stage designers collate the information that has been gathered, analyse and synthesise observations and define the problem statement in a human centred manner
- ▶ **Ideate** – At this stage designers begin to generate ideas and think “outside of the box”.
- ▶ **Prototype** – At this stage designers begin to build inexpensive, scaled down versions to begin problem solving solutions to potential problems identified in the previous stages.
- ▶ **Test** – Whilst testing is the final stage of the process, it is iterative in nature and can reveal

## Generative Models of Culture

The **first case study** by Irani et al. describes a situation where the researcher was provided with a design brief to develop a sensor network for the elderly to assist independence. The target users were from the countries Brazil, Russia, India and China. The resources available only allowed for research to be conducted locally (a mid-sized town in the United States), so the researcher began to interview members of the community who had recently or historically emigrated from these regions. These actions were undertaken during the **Empathise** and **Define** stages of the Design Thinking process.

The design brief provided to the researcher taxonomized culture as a static, point in time definition to distinguish between user groups. This limited the complexity of culture demonstrated by the various participants. For example, self-identification of culture differed depending on the context of the activity undertaken by the participant. Some actions were self-viewed as being foreign while other actions were seen as being “American”. Participants demonstrated and drew from a wide range of complex technical and social resources that bridged between domestic and international networks.

Key components of the **Empathise** and **Define** stages are to collect information that inform and evolve the project’s problem statement. Irani et al. highlight popular frameworks (Hall, 1977; Hofstede, 2005) that promise generalisability along familiar scales and juxtapose this with HCI researchers that have found these frameworks analytically weak for design purposes (Easterbrook et. al, 1993; Ess & Sudweeks, 2005; Marsden, Maunder & Parker, 2008). Grounding design processes with static, point-in-time culture definitions is in direct contrast to the societal fluidity of modern technological adaption.

In response to this, the Irani et al. offer their first insight into **postcolonial computing: generative models of culture**. This highlights the following shift in perspective that “rather than classifying people on various cultural dimensions, reflect on how technological objects and knowledge practices become meaningful as social activity unfolds” (Irani et al., 2010, p. 3).

The authors highlight this perspective shift as especially important, as understanding transformations effected by technology design requires an understanding of cultural change as much as cultural stabilities. Definitions of culture that rely on static assumptions only focus on cultural stabilities and fails to take into account the designers out-of-awareness assumptions.



Figure 2 - A generative model of cultural allows the complexity of individuals to accounted for in the design process

## Development as a Historical Program

The **second case study** focuses on an international non-government organisation (NGO) who's mandate is to adapt cheap technologies in developed countries and apply them in developing countries. In this case the product was a water filter for Indian people living in poverty to cure water-borne illnesses. The researchers needed to complete home placement tests of a prototype in local conditions. In this phase the researchers are moving between the **Prototype** and **Test** phase of design thinking.

The brief required a stereotypical poverty stricken local who was retrieving water from a dirty supply without a filter. When field studies commenced, the researchers were confronted with relatively happy and proud people who rarely complained of water-borne illnesses. The participants main concern was over-fluoridated wells, which the filter would not address. After loosening their image of an ideal participant, the team members were able to carry out testing.

Through a comparison of related HCI research (Butler, 2007; Ferguson, 1990, 2006; Fisher, 1997; Gupta, 1998), Irani et al. (2010) highlight four key critiques of the case study which informs this element of **postcolonial computing**. Each critique seeks to unpack **development as a historical program** and the inherent colonial power structures that are intrinsic in contemporary development processes and is unpacked in the next four sub-sections.

### The discourse of global, technical solutions to problems

Current development regimes have focused on applying a local, technical solution (which has often been designed in isolation) to complex situations and challenges. While this may be good practice in user centric design, oversimplifying a complex problem can create blind spots in the design process. Taking a successful product from one setting and retrofitting it into a “developing” context can be fraught with unconscious bias and hidden assertions of power. A simple technical solution must be implemented within the context of the complex problem it seeks to address.



Figure 3 - Simple Technical systems cannot solve complex challenges without an awareness of the full context

### The alignment of development projects with interests of commercial entities in industrialised countries

Development projects that are aligned to large industrial organisations can have unintended consequences, which at the time the paper was published, was underrepresented in research. In the case study above, the NGO aligned with a large multinational company who had established distribution and retail channels. Bringing in large, for profit partners into development projects raises additional complexities around investment and perceived intellectual property.

### The directionality of product and monetary flows in development program

In colonial times, raw resources would flow from the colonies back to the colonial centres, with the movement of finished products in the opposite direction. Irani et al. indicate that this is much

the same in development. Projects that channel money into a developing area exert considerable control on the flow of these money and resource channels.

### Disempowerment through consumer-oriented development

Local, individual strategies attempt to build a market of consumers. This can be argued as being inherently disempowering to these consumers. This involves the provisions of goods and services that positions the recipients of these development projects as consumers of the goods and services provided. While creating a consumer base may not outwardly enact disempowerment, it can create uneven relations of economic dependencies.

### Uneven Economic Relations

The **third case study** describes a Brazilian company in the 1980s that responded to a government push to design and manufacture products within the country. The company responded by reverse engineering, designing and manufacturing an Apple Macintosh compatible machine named “*mac de periferia*” (Mac on the periphery). At the time Apple did not have intellectual property protection in Brazil. Through sheer economic strength, Apple was able to reshape notions of authorship in Brazil to exclude reverse engineering and modification. This forced the Brazilian’s to align their notions of authorship with “American” perspectives. These



Figure 4 - Uneven economic relations can lead to developing economies having to conform to developed economies norms

notions privilege the creators over the maintainers and modifiers of software and hardware. The impact of these economically motivated legal actions shapes design work, innovation and creativity.

The Brazilian company took an existing product and applied design thinking in its entirety to reimagine a product that addressed local requirements.

Irani et al note the critical value this case study represents. The “*mac de periferia*” transcended economical value and return and existed as a **meaningful claim of Indigenous technological capability in reverse**

**engineering, local manufacture and independence from external economies.** This contrasts common design methods that value creativity and originality with methods that reconfigure existing technology that is not fit for purpose in an alternate operating environment.

The reading notes that in similar cases in Peru, a push for free software over proprietary based software was seen as a way to reduce dependence on external actors. Open source software provided free use on appropriation and translation of methods, process and products. This led to new methods and techniques that were born of western origins but were shaped by the technologies’ cultural meaning in unique social and historical settings (Chan, 2004; da Costa Marques, 2005; Phillip, 2005).

Uneven flows and exchanges of capital throughout technological uptake have implications on design method, software adoption, usefulness and usability (Irani et al., 2010).

## Cultural Epistemologies

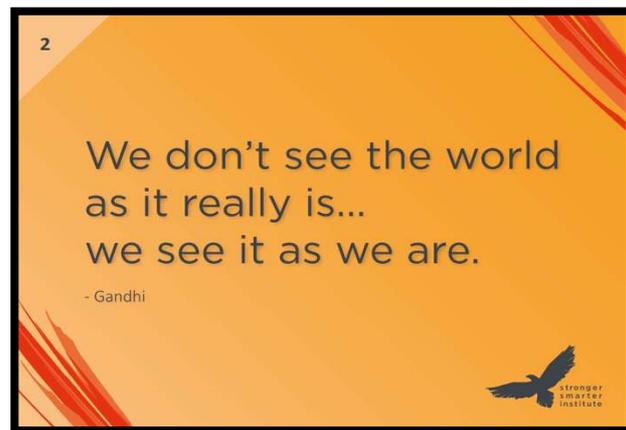
The **final case study** was a collaboration between members of the Yolgnu community in North-East Arnhem land and researchers in Darwin, Melbourne and California. The project aimed to use video conferencing technology to collaborate with Yolgnu **Indigenous Knowledge Experts (IKE)** to allow them to lecture into university classrooms across the world from their homelands.

A suggestion was made by a non-Indigenous member of the team that a good learning activity for students would be to view a discussion between the IK expert and her brother in regard to Turtle Dreaming. Turtle Dreaming was previously shared with students in a previous session. The response from the **IKE** highlighted kinship avoidance lore and the requirement to move to a site where the **IKE** had the authority to retell the story.

Epistemology is a philosophical term that encompasses theories of knowledge and how knowledge is collected, constructed, organised and translated. In a broad sense epistemology encompasses ways of knowing. In this case, the western researcher's ways of knowing differed from that of the Yolgnu IK experts. This led to the IK expert having to guide the researchers through a third cultural space to understand their viewpoint. Cultural epistemologies can differ between cultural groups and the understanding of this is imperative in the design process.

Traditional design methods are firmly grounded in making knowledge portable (Irani et al., 2010). This is in direct contrast with many other ways of knowing (Bidwell, Standley, George & Steffensen, 2008; Gupta, 1998; Srinivasan & Shilton, 2006; Verran & Christie, 2006) and especially Indigenous ways of knowing (Talbot, 2017) which are often place based and dependent on who is an authority of that knowledge. With western ways of knowing forming the dominant perspective across many developed countries, what is even considered to be knowledge is skewed towards a western lens. Being aware and sensitive towards the cultural conditions of knowing and telling is relevant to HCI design methods due to the centrality of knowledge sharing and knowledge representation to HCI design.

The previous **four case studies** are all taken into account when applying postcolonial computing to HCI4D processes. However, it is important to note that **postcolonial computing** is not a stand-alone design process, but a lens on which to "... focus attention on the translations, dependencies, conditions and histories that shape perceptions of technologies and its opportunities" (Irani et al., 2010).



*Figure 5 - The digital age allows knowledge systems to transcend physical borders. Developers need to be aware that their dominant knowledge system may not align with their collaborators.*

In the final section of Irani et al. (2010), the authors now broaden the notions of what is considered design work through categorising stages into the categories of **Engagement**, **Articulation** and **Translation**. Through abstracting design methods into these aspects, it is hoped to make clear the relevance of issues such as power, history and epistemology within the traditional design process.

## Engagement

**Engagement** occurs intrinsically throughout the design process. From the beginning stages when a problem is being investigated and designed, through to prototyping, testing and feedback. Each **engagement** that occurs can be a transcultural encounter, not only between designers and users but also between design team members, corporate and non-corporate organisations, and increasingly between differently located teams working collaboratively.

Throughout these encounters information and knowledge is collected, shared, interrogated, organised, analysed and eventually defined. Design methods have processes that aim to increase objectivity to ensure that the information maintains integrity throughout these processes. Incorporating a postcolonial lens to these encounters allows for designers to develop awareness of their own perspective and the influence this can have on end products.

In a school and classroom setting it is important to know who your students and community are. Indigenous communities in Australia are complex, discrete and unique. Whilst many strategies are designed and conceived with remote Indigenous Australia in mind, it is important that organisations note that the majority of Indigenous Australians reside in urban areas (Australian Bureau of Statistics, 2018). A generative model of culture allows designers to shift from a mindset of developing appropriate technology for static, container bound cultures to viewing design work as an “*intervention both in conversation with and transformative of existing cultural practices*” (Irani et al., 2010, p. 4).

The postcolonial shift within **engagement** occurs when designers shift from seeking knowledge through extractive processes to mutual encounters and learning with participants (Irani et al., 2010). Designers are encouraged to hold a conversation, rather than follow a recipe. This will allow for deeper insights into the context of each encounter. This highlights two key lessons when reframing design processes:

- ▶ designers must acknowledge users as active participants and partners rather than as passive repositories of “lore” to be mined
- ▶ recognition of each encounter as an intentional, motivated, and power-laden act (rather than as an inherent consequence of an impersonal process)

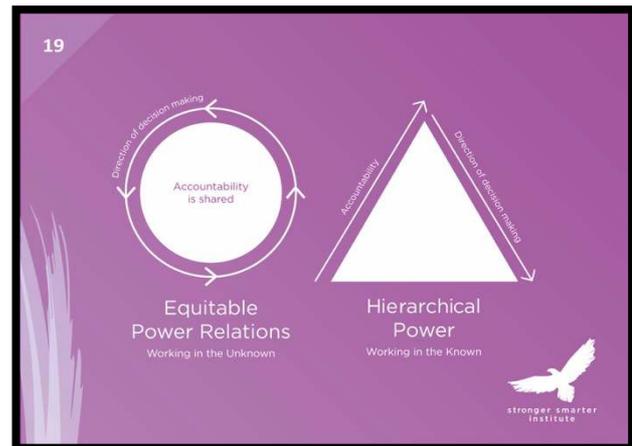


Figure 6 - Postcolonial computing promotes equitable power structures in the engagement phase

## Articulation

The authors define **articulation** as the way designers might see and frame a situation. It is concerned with how the experiences of the engagements are abstracted and reframed to fit more ideally into design practice. The **articulation of engagement** is culturally specific for both the designer and their audiences.

Common articulations currently situated in design practices are formal and informal representations. These may take the form of persona for imagined users, task flows that represent work processes or research summaries that contain implications for design. These representations are usually required to be portable and intercultural between designers and implementers. However, upon applying a postcolonial lens, the highly situated nature of knowledge practices contains at least two implications for HCI4D

- ▶ HCI methods often see knowledge as something to be captured, rather than something to be performed or enacted as it is in other cultural settings.
- ▶ These seemingly mobile representations mentioned earlier are themselves highly localised and connected to specific practices of seeing and interpretation.

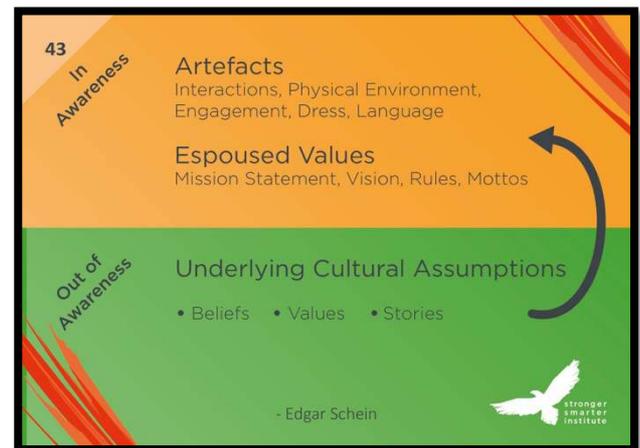


Figure 7 - Applying a postcolonial computing lens provides designers with a reflective analytical standpoint when articulating information

An example the authors use of articulation being value laden and situated with the designer's world view is that of the One Laptop Per Child (n.d) program. This program was designed to equip people from developing areas with a resource that was perceived as being absent when compared to a developed area, the *personal* computer. The program was implicitly based on individual ownership of technology. In many communities around the world, ownership does not necessarily follow the western paradigm as owned by the individual. When design needs and requirements are articulated, they reflect a series of ontological, political and economic considerations that are integral to the design.

Developing awareness of one's own out-of-awareness assumptions and local context allows for a more authentic approach to the **empathise** stage of design thinking process. These skills and processes are foundational to the Stronger Smarter Approach and metastrategies (SSI, Stronger Smarter Institute, 2017a).

Postcolonial computing is not a matter of finding the right ethnographic informant or the true way of articulating users' ontologies. It is a matter of grappling ... with how to design when the certainty of perfect intercultural translation is not possible. (Irani et al., 2010, p. 8)

## Translation

Translation in design methods is concerned with the transformation of requirements into statements about technology or technology itself. The authors highlight that the word *translation* has both linguistic and geometric connotations. The linguistic meaning of translation literally means to transform one language to another, a process that is deeply culturally situated. In a geometric sense, *translation* refers to the movement of a figure from place to place.

A shift is required from thinking of design methods as being portable, when in essence they are predicated on the assumption that translation preserves meaning. A postcolonial lens highlights the importance of *translations* to be purposeful, partial and situated in context.

These *translations*, while within framework of design method, are intrinsically linked with the location and knowledge systems of those who have translated. As these design methods become portable, they are now subject to different interpretations and become locally meaningful to design in different ways. While it is common to recognise the cultural specificity of design products, design processes and methods have largely been imagined as universal.

While HCI research has recognized the cultural specificity of design products, the processes and methods of design has largely been imagined as universal. Taking a broader view, we would argue that methods – the products of research communities, economic actors, and educational practices that span the globe – are always transnationally produced and dynamic. (Irani et al., 2010, p. 9)



*Figure 8 - Implementing a postcolonial computing lens to digital technologies curriculum provides the opportunity to create a new culture in a classroom space*

## Summary of Key Points

Irani et al. (2010) are clear that they are not being critical of current design processes. The lens of postcolonial computing is offered to expand the conversations around HCI4D efforts. A key weave throughout the paper is the need to apply a postcolonial lens alongside dominant design approaches. This approach is responsive to *terra nullius* education (Matthews, 2015) discussed in a previous [reading review](#) (SSI, 2017b). Introducing students to postcolonial computing at all stages of their digital education provides them with an important intercultural tool that can be applied across multiple learning areas and provide Indigenous students an orientation to claim and enact **digital land rights**.

### **Generative model of culture**

- ▶ Irani et al. (2010) suggests that the generative model of culture allows designers to shift from a mindset of developing appropriate technology for static, container bound cultures to viewing design work as an “*intervention both in conversation with and transformative of existing cultural practices*” (Irani et al., 2010, p. 4) .

### **Development as a historic program**

- ▶ Understanding the impact of colonisation across the continent and the unequal distribution of power inherent in western development structures gives teachers a starting point for building self-awareness. This self-awareness will allow teachers to consider how historical influences shape their perception when applying and teaching design thinking.

### **Uneven economic relationships**

- ▶ Uneven economic relationships permeate technological advancement and deployment. Systems need to be aware that purchases and deployment of technology is consciously and unconsciously grounded in consumer orientated development (Irani et al., 2010).

### **Cultural epistemologies**

- ▶ A postcolonial lens implores designers to be aware of differing **cultural epistemologies**, and how these impacts on the design process.
- ▶ The way knowledge is constructed, translated and transported is not universal or grounded in western approaches. This understanding forms an integral part of the **postcolonial computing** lens.

### **Implementation**

- ▶ To implement a postcolonial lens on design work requires a broadening of what is considered design work into:
  - Engagement – intrinsically occurring throughout the entire design process
  - Articulation – how a designer might view and frame a situation
  - Translation – the transformation of requirements into technology

HCI researchers have had to substantially adapt HCI methods to address to the very different social, cultural, infrastructural and economic situations of HCI4D (Irani et al., 2010). This fact alone points to the very significant need for K-12 educators to understand, apply and reflect on these practices and how a postcolonial computing lens provides an increased toolkit and relevance to a broader range of learners in Australian classrooms.

## Stronger Smarter Provocations and Discussions

- ▶ A postcolonial lens is an essential addition to designer toolkits. While this Irani Et. al paper has been written for the post schooling sector, it is imperative that students are introduced to this thinking in the K-12 space. Educators and education systems are tasked with ensuring that multiple perspectives are incorporated within all classrooms. Intercultural understanding is foundational to the global citizen movement and the Stronger Smarter Approach Framework provides educators with the core strategies to introduce and incorporate a postcolonial lens to design education.
- ▶ In a recent survey of Australian teachers self-efficacy and assessment processes for the K-12 Digital Technologies curriculum, Vivian & Faulkner (2018) highlight the following challenges identified by teachers
  - A demonstrated need for deeper PD that makes strong linkages between content knowledge, explicit assessment strategies and examples of practice
  - Stronger leadership support in implementing school wide strategies
  - Time to explore, design, implement and build their own experience and confidence in assessment for Digital Technologies

The Stronger Smarter Institute **SSiSTEMIK** pathways masterclasses are designed to offer participants these opportunities. When combined with the Stronger Smarter Leadership Program, schools are positioned to enact a cultural shift towards a more effective and inclusive teaching and learning program. Awareness that a difference in the construction, translation and transportation of knowledge is the first step for educators. A shift in being aware of cultural knowledge differences to actively implementing pedagogy that seeks to perpetuate and foster cultural pluralism, opens the doorways for **culturally sustaining pedagogies** (Paris, 2012).

- ▶ Austrade (Australian Trade and Investment Commission, 2016) promotes Australia's cultural diversity as an ideal location for investors to "develop new content and trial it, with the end goal to service global markets". Complexity of culture provides the opportunity for unique design solutions within the global market. Increasing all Indigenous Australian's digital capability is therefore critical to ensure that Indigenous communities across Australia are positioned to take full advantage of the economic windfall that this opportunity may provide.
- ▶ The majority of reports referenced in this reading review in regard to Indigenous Australian's engagement with the digital world fails to take into account the diversity of Aboriginal peoples and Torres Strait Islander peoples of this country. The yardstick has been set for measuring uptake and the use of technology through a western centric user methodology. However, Aboriginal and Torres Strait Islander people demonstrate a variety of ways that they have adapted the use of various technologies to their particular setting (Shaw, Brereton, & Roe, 2014). The Stronger Smarter Institute agrees that more detailed research is required to gain a clearer understanding of digital inclusion in these communities (Thomas et al., 2016) and sets a further challenge that this research is conducted in collaboration with Indigenous organisations.

## Stronger Smarter Metastrategies weaves

This research connects with all five of the Stronger Smarter Metastrategies:

### Metastrategy 1 - Acknowledging, embracing and developing a positive sense of identity in schools

The postcolonial computing lens is centred with acknowledging that a voice exists with the computing space that represents the non-dominant ways of thinking and doing. By stepping back and reflecting upon and interrogating the current design systems, teachers can acknowledge that already bring a strong and smart philosophy to design thinking.

### Metastrategy 2 - Acknowledging and embracing Indigenous leadership

Aboriginal peoples and Torres Strait Islander peoples have been designing solutions to on this continent for time immemorial. These include adapting to global events such as climate change and changing seas levels. A postcolonial lens acknowledges the inherent design thinking ability within communities and how this strengthens Indigenous students' opportunities within the curriculum.

### Metastrategy 3 - High Expectations Relationships

Each postcolonial lens is situated within High-Expectation Relationships. To incorporate each element, one must understand how they view and make sense of the world and be aware that this may not align with others. Through supportive and challenging conversations, the opportunity to design robust, hybrid solutions present themselves.

### Metastrategy 4 – Innovative and dynamic school models

Postcolonial computing has only recently been implemented at a higher education level within the Australian context. Schools that add this to their current teaching toolkit will be among the most innovative in the country. Design and Technologies curriculum will be able to boldly step forward with the foundations of 65000+ years of Indigenous Knowledge insights.

### Metastrategy 5 – Innovative and dynamic school staffing models

Implementing a postcolonial lens is anchored upon building meaning partnerships with both designer and end user. In a school setting this connects through the teacher, the student and the community. Through the co-creation of power between teachers and Indigenous education workers, opportunities to develop engaging new learning activities that students can apply within the classroom and beyond the school gates is an exciting opportunity.

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