

# A conceptual model of indigenous knowledge applied to the construction of the IT artefact

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## ABSTRACT

Technology is becoming a one click and view everywhere landscape impacting the way indigenous communities communicate, and the way they define their digital selves” (Shedlock, Vos, & Chard, 2016). Whilst there are a number of well-structured works and publications that focus on the assembly of the IT artefact using a contemporary format, limited attention has been given towards interpreting indigenous views of the IT artefact such as the incorporation of indigenous practices and processes during its creation. As a result, a disconnection is occurring between the IT artefact created and the IT artefact enjoyed by indigenous communities. This is placing both technology and indigeneity at opposing ends of the IT construction continuum with no clear link between each. A theoretical model conceptualizing imbedded indigenous knowledge is reviewed using literature from indigenous researchers involved in indigeneity, technology and the artefact construction. Five layers are revealed as a framework, in pursuit of an indigenous blueprint adopted during the construction of the IT artefact.

**Keywords:** Indigenous, indigeneity, indigenism, indigenous research, indigenous technology, indigenous artefact, imbedded indigenous knowledge.

## 1. INTRODUCTION

This study is positioned as an entry level research topic seeking to match indigenous processes and practices to the construction of the IT artefact. Indigenous communities must ensure technology principles respect a definition for indigenous knowledge that is grounded by indigenous theory for constructing and empowering change (Dyson, Hendriks, & Grant, 2007). The notion of an indigenous Information Technology (IT) framework employed during the construction of the IT artefact offers new streams of understanding and engagement between Indigenous and Eurocentric research. However, indigenous knowledge and western knowledge consist of two distinctively different world-views with opposing understandings towards how knowledge is applied during the construction of the artefact. The technology focused artefact is often viewed as a process used to solve a problem comprised of constructs, models, methods and instantiations (Gregor & Hevner, 2013). From an indigenous view, the artefact is a result of time honored traditions and heritage knowledge passed down through the generations. The artefact was considered to be a living treasure crafted through the skillful knowledge of expert creators forming a structure permeated with the breadth of life (Thater-Braan, 2007).

Given the lack of research publications involving indigenous theory that examines the indigenous IT artefact construction, a generalized approach is taken to determine ‘what knowledge is available’ in an effort to ascertain gaps that may exist - if any. The paper collates indigenous interests in research to identify common elements important to indigeneity when constructing the IT artefact. Challenges that exist between western and indigenous research during the knowledge transfer process are reviewed and highlighted. Thereafter a theoretical model is

presented from the literature review in search of an indigenous model that reflects the construction of the IT artefact.

## 2. PROBLEM STATEMENT

As mentioned, insufficient attention has been given towards interpreting indigenous views and the involvement of indigenous practices and processes during the creation of the IT focused indigenous artefact. The risk of the digital divide widening and, adding further barriers to indigenous research justifies rapprochement if not addressed i.e. the IT researcher will be unable to access indigenous related content when constructing the indigenous IT artefact. This presents the question, can there be a set of indigenous practices and processes applied to the construction of the indigenous IT artefact?

## 3. METHODOLOGY

The method for this study following Gregor & Hevner, (2013) begins with a problem statement that is introduced early and investigated further in the literature review. The literature uses prior relevant work and theories from indigenous content experts as a channel for framing an indigenous mode of research. Knowledge concepts are reviewed as part of the knowledge transfer process highlighting the variances between both indigenous and western research. The artefact exists in the form of a prescribed concept model configured from the literature as a reflection of indigenous research activities described. Evaluation considers the differences identified in the literature and matched against the resulting artefact process map constructed to lead practice during construction. Discussion provides an overview of the research topic and seeks to aid both the research environment and, the related body of knowledge’s kernel theories. The conclusion completes the research cycle with findings stated as new contributions to the knowledge base of the research topic outlined (Gregor & Hevner, 2013).

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## 4. LITERATURE REVIEW

The literature review espouses indigenous research as a body of knowledge that supports the question posed as an initial response. To begin, a definition is adopted and then, literature outlining the emergence of indigenous research is introduced as a body of knowledge with its own framework. Thereafter, framing philosophical world-views between both western and indigenous approaches towards research is presented which considers two paradigms each with distinctive knowledge building directives that impact the artefact construction. Finally, indigenous literature that highlights the challenges and extent of variations between indigenous and western knowledge that impact the construction of the indigenous IT artefact is reviewed.

### 4.1 Defining Indigenous

An original definition of indigenous was accepted in 1972 by the UN Working Group for Indigenous Peoples, but was considered too restrictive and was later amended to the following version in 1983.

“.... descendants of the peoples who inhabited the present territory of a country wholly or partially at the time when persons of a different culture or ethnic origin arrived there from other parts of the world, overcame them, by conquest, settlement or other means, reduced them to a non-dominant or colonial condition; who today live more in conformity with their particular social, economic and cultural customs and traditions than with the institutions of the country of which they now form part, under a state structure which incorporates mainly national, social and cultural characteristics of other segments of the population which are predominant” (The United Nations, 1972).

### 4.2 Emergence of Indigenous Research

Indigenous research is a growing topic of study linked to domain fields such as sociology, anthropology, psychology, health, gender, education, archival libraries and heritage institutes to mention a few (Cameron & Kenderdine, 2007; Dyson et al., 2007; Hamilton - Pearce, 2009; Massey & Kirk, 2015). It is about empowering people's voice, practices and processes as embedded knowledge in existence, challenging the notion of normal that has been constructed by the dominant culture. Indigenous research seeks to identify and uphold aboriginal views, solutions and ways of knowing, representing an organised world-view with its own philosophical beginnings (Henare, 1998). Successive settlement governments have dogged indigenous communities with disenfranchisement, marginalisation and disempowerment (Butts, 2003; Young, 2004). Supporting the development of indigenous research has seen the traditions of western research come under much scrutiny, raising questions around the impacts of research upon indigenous communities (Martin & Mirraoopa, 2003). Further stated by (Hutchings & Reynolds, 2005):

For Indigenous peoples, the term “science” has had specific meaning. “Science” has been experienced as the handmaiden of colonialism. In the name of science, colonial (historic and contemporary) explorers have named, described, categorized and defined indigenous peoples and their knowledge. Indigenous people have been researched, experimented on, and samples of their genes have even been extracted, identified and then bought and sold (Hutchings & Reynolds, 2005, p. 13).

Previously, institutes studied aboriginal interests without consideration towards the community concerned, misrepresenting indigenous ways such as their protocols, processes and, practices (Shawn Wilson, 2003). In Canada, calls for an indigenous method of research have been echoed in

academic hallways in support of an independent indigenous research movement (E. Steinhauer, 2002). In New Zealand, suggestions towards adopting aboriginal methods inside a western research framework have been put under the research lens (L. T. Smith, 1999) also offering indigenous ways towards research (Tuhiwai & Reid, 2000). These events among others have created outlets for researchers with indigenous research interests offering solutions weaved between both indigenous and western research paradigms (P. Steinhauer, 2001). Furthermore, research contributions have begun to generate wide discussions in conference and publication confronting and expanding challenges to indigenous research (Atkinson, 2001). Now, indigenous research is becoming a highly discussed topic with its own philosophical stories, approaches and ethical considerations in pursuit of a research paradigm affirming its rights as a legitimate body of knowledge (Clarke, 1998).

Critics of indigenous research point out similar approaches had been adopted by anthropologists previously obtaining data using an anthropological framework. Stated contributions to the domain's kernel theory was minimal (Kwang-Kuo, 2005). Poortinga (1999) indicated the use of multiple indigenous methodologies implied a restriction for the development of indigenous theory as the development of many methodologies not only constrained the scientific requirement of diligence, but also made the boundary of indigenous research a pending problem. For example, if every indigenous community developed their own philosophical reflection towards its self, how many modes of indigenous thinking would have to be developed? However, in response, the final goal of research by indigenous researchers was to develop an indigenous framework engaging with indigenous development (Agrawal, 1995), understanding indigenous knowledge (Howes & Chambers, 2009), discussing the purpose of constructing indigenous knowledge ways (Kwang-Kuo, 2005), critical analysis of indigeneity (Levi-Strauss, 1966), progressing indigenous research (Shawn Wilson, 2003), and decolonizing methodologies (L. T. Smith, 1999) all contributing to a framework of indigenism in research.

### 4.3 Framing Indigenous Research

One of the challenges for indigenous research arises when attempts are made to frame the topic under research as being indigenous. Declaring a philosophical approach may influence the path taken to the extent the approach may become monolithic without consideration for the holistic world view ‘*as it appears to exist*’ to the indigenous community concerned. A further complexity is now exposed, can there be a non-indigenous perspective framed as an indigenous paradigm i.e. a set of indigenous beliefs about the world, and how indigenous researchers go about obtaining knowledge, the researchers state of thought, the researchers actions, the researchers method of enquiry encompassed as an indigenous paradigm (Shawn, 2001). A study by G.Smith (2000) in framing indigenous research, provides guidelines where the indigenous researcher should declare the direction to be used during study as their own with the following assistance:

1. Be proactive and name the world for themselves (L.T.Smith 2000);
2. Craft the research as their own version of science;
3. Include how science and scientific understanding will be used in their world;
4. Develop a model of democracy that goes beyond the “Westminster – one person, one view, majority rule (G.Smith, 2000);
5. Use theory proactively as an agent for change, but act in ways that are accountable to the indigenous community and not just academia;
6. Resist new forms of colonization.

With the guidance of a research frame, the next priority becomes a research effort that contributes to the body of knowledge in existence. Hevner, (2007) offers insights to knowledge gathering activities using the artefact and, in future studies goes on to prescribe two key contributions for a research effort to be successful (Hevner & Chatterjee, 2010). The first being the relevance of research that targets the research environment i.e. research connecting the indigenous community to knowledge and the other being, the rigor applied to the domain knowledge base under examination in search of a contribution to existing kernel theory.

According to Tedre & Pajunen, (2013), knowledge can be based on subject rationalising and the learning that emerges from participants (how we know what we know) forming two epistemological modes of knowledge being (a) rationalism and (b) empiricism. Whilst rationalism is more than likely an achievable direction applying the interpreted understandings of indigenous research '*as it appears to exist*' to the indigenous community involved in research, empiricism requires an approach that leans towards positivism and the notion of a world that is enabled by scientific theory stated '*as it exists*' with general predications. However, empirical facts tend to be individually experienced. No matter how many times a particular experience is repeated, it cannot verify a proposition of general prediction. For example, no matter how many indigenous communities are observed, the proposition of general predication 'that all indigenous communities are unique' still cannot be verified, because the observations cannot include all indigenous communities. Therefore, researchers are unable to verify theoretical propositions, only falsify them, or reserve them temporarily before they are falsified (Kwang-Kuo, 2005). Furthermore, a researcher's theory is not persuaded from empirical facts, but inferred by the researcher with critical rationality thereafter Popper (1963) who goes on to state in further study:

'the water bucket of scientific theory will not be spontaneously full so long as scientists work hard to fill it with accumulated empirical facts. Instead, theory is like a searchlight. Scientists must continuously bring up problems and make conjectures, so as to cast the light of theory on the future' (Popper, 1972, pp. 431–457).

When framing a research topic, philosophical differences are exposed as are terminology gaps both in interpretation and use in research however, any distinctions in philosophy and terminology can be mitigated by explicitly framing the topic under research as being indigenous (L.T.Smith 2000).

#### 4.4 Indigenous Relationships in Research

A second fundamental challenge is centered around individual knowledge versus relationship knowledge where the dominant paradigm builds upon the belief that knowledge is an entity; the researcher is an individual in search of knowledge, and knowledge is something that is gained and therefore, may be owned intellectually by an individual. On the flip side, an indigenous paradigm moves beyond the concept of individual knowledge to relational knowledge as a shared collective (Grant, Dyson, & Robertson, 2010; Henry & Pene, 2001; Shawn, 2001; L. T. Smith, 1999; Thater-Braan, 2007; Tuhiwai & Reid, 2000; Shawn Wilson, 2003). An indigenous paradigm of research comes from the fundamental belief that knowledge is relationally shared with all of creation i.e. there is an echoed link with the family, the community, the planet, the universe that is shared ((Begay & Maryboy, n.d.; Denzin, Lincoln, & Smith, 2008). Further discussed by Wilson, (2008) relationships don't just shape indigenous reality, they are our reality. Indigenous researchers develop relationships with ideas to achieve enlightenment in the ritual of indigenous research.

Indigenous research is the ritual of maintaining accountability to these relationships. For researchers to be accountable to all of the relations, they must make careful choices in selecting topics, methods of data collection, forms of analysis and finally in the way information is presented (S Wilson, 2008).

#### 4.5 Engaging Indigenous Research

A third challenge arrives in the way research is accessed when representing the nature of the topic which the researcher is engaged. According to Grenier, (1998), indigenous research is characterized as being "unique, traditional, local knowledge existing within the developed around specific conditions of indigenous communities to a particular geographic area". Where western science is an open system whose supporters are always aware of the possibility of alternative perspectives to those adopted to any particular point of time. Western scientific knowledge as an object of monolithic analysis considers knowledge as the ability to break down data presented and then rephrase it into meaningful understandings using newly formed patterns (Shawn Wilson, 2003). Indigenous research, on the other hand, as a closed system, is branded by a lack of awareness that there may be other ways of regarding the world (Agrawal, 1995). The discourse caused to position indigenous knowledge and the imported western knowledge has been frequently viewed with mistrust by the colonized (Stillman & Craig, 2006). Furthermore, indigenous communities have often attached layers of protection and security with a seemingly closed research framework preferring to stay within their own backyard in avoidance of western research (Odora Hoppers, 2002, p.24). This may also reflect the history of indigeneity not really being understood in the technology sector, however without excuse in modern times.

#### 4.6 Discovery of Indigenous Research

A forth challenge investigates differences between scientific knowledge and indigenous knowledge, reveals insights in the way phenomena are observed and ordered:

"The scientific track of thought is characterized by a greater ability to break down data presented to the senses and to reassemble it in different ways. The mode of indigenous knowledge, on the other hand, is '*concrete*' and relies almost exclusively on intuition and evidence directly available to the senses" (Levi-Strauss, 1966 p.15).

The social structure such as the laws, ideologies and theories '*as it appears to exist*' to the indigenous community involved in research determines and leads practice (Tedre & Pajunen, 2013). The observation and order of events linked to meaningful understandings exist in the form of perceptions that involve sensory and intuitive information adopted in practice. The notion where reality is constructed by the indigenous community through the observation of known events '*as it appears to exist*' to the community involves mind-dependent phenomena as a mental state of consciousness through the thoughts, attitudes, feelings, values, preferences and memories for as long as the indigenous community remains on earth as either individuals or as a community collective.

Further discussed by Sefa Dei, (2002) as knowledge consciousness arising locally and in association with long-term occupancy of a place. Indigenous knowledge makes itself spatially available to perception and suggestion as a conscious state of thought, aware of the possibilities for alternatives and perspectives based on tactical relevance, suggestion and, a mental approach uniquely available to the community concerned (Begay & Maryboy, n.d.). The way indigenous communities refer to conceptual content is unique to each subset of indigeneity represented. According to a study of indigenous difference by state of thought (Kwang-Kuo, 2005):

A mentality is owned or exercised by some group of particular individuals, so it can be a subject for research. In contrast, mind refers to all the conceptual content that any human being might ever cognize and activate. Mind means the totality of actual and potential conceptual contents of human cognitive process and mentality denotes, the cognized and activated subset of mind” (Kwang-Kuo, 2005 pg.8).

Whilst the *universal mind* of indigeneity cannot become the topic when conducting indigenous research without a large-scale research program that involves investigating all indigenous communities. The above literature reveals a mental eco-system of indigenous research interconnected through a cosmology of suggestion and possibilities based upon a state of conscious intelligence in thought that is spatially unique.

#### 4.7 Construction of Indigenous IT Artefact

Indigenous people were proactive creators of the artificial embracing new technologies such as creating tools for ocean navigation, preserving food, creating weapons for hunting and warfare, making clothing, and building dwellings as well as recording knowledge using known events depicted in carvings, weaving, tattooing, storytelling and music alike (Bird, 2018; Boxall, Englin, & Adamowicz, 2003; Reed, Mikaere, & Reed, 2012). These creators were provided with status as knowledge holders and ancestral communicators,

There is much debate regarding the relevance of indigenous attempts to involve ‘indigenous or spiritual’ representations during research often labelled as either misunderstood or rated as irrelevant (Hutchings & Reynolds, 2005). Concerns from indigenous peoples with regard to technology stem from the connection that indigenous peoples have with the land and the environment during the artefact construction. However, indigenous researchers are left to pursue ongoing directions in their own research space with their own indigenous protocols in research i.e. a research space that accepts obligation towards guardianship of ancestry, the environment and, the world of the non-living.

Providing an example, when constructing the technology focused artefact, in the traditional format of Maori tattooing (Moko). The traditional Moko is lengthy and painful. The tools consist of small sharp bone points tied together in the shape of a spear with four or five prongs, hit with a hammer of wood onto the skin to form an inked pattern. The points are arranged in a straight line for tattooing, and an expert operator is able to do it much more quickly than a beginner (“Maori and psychology: Research and practice..” 1999 p.27).

The lines of the Moko are perpetuated with meaning. Recorded in the design are the wearer’s ancestry (whakapapa) and the essence of one’s identity (mana). Accordingly, the Moko was such a clear statement that it was considered bad manners to ask a person who they were (“Maori and psychology: Research and practice..” 1999 p.27).

Objects exist as tools where the Moko knowledge holder (tohunga) is able to apply known events using knowledge of symbols, patterns, terminology as a visual language unique to the owner and specific to the indigenous community concerned. Alternatively, when the Moko is digitally portrayed either by image or other forms of visual enhancement, the instantiated piece however enjoyed, is unable to truly reflect the physical real-world version of the artefact during construction creating uncertain links to ancestry, spiritual connections, naming convention used and, even intellectual relationships.

For indigenous women involved in technology, Mana wāhine in information technology: Ngā kaiwhatu kākāh

u me te kākahu, Hamilton-Pearce, (2009) describes indigenous technology as:

An opportunity for Māori to create and design software in tracing your family tree because existing software doesn’t fit the extended family mould – so someone in an extended family knows this works in order to design this (Hamilton-Pearce, 2009, p. 170).

To assimilate in to the geek neo-colonial world has meant the absence of being indigenous Maori women in IT (Hamilton-Pearce, 2009, p. 175).

As a further example, a visual model is offered by Thater-Braan, (2007) during a learning encampment by the Native Science Academy who subscribe to the theory “technologies are recognized as living treasures imbued with the breath of life” (Thater-Braan, 2007 p.6). The Virtual Kiva Fig:1 below is cosmically aligned with events occurring in the East, the direction of the rising sun and place of all beginnings. The model aligns with the other cardinal directions of the South, West, North, Earth and Sky. The Virtual Kiva contains and provides alignments with the sun, moon and stars. It is a circular shape, the circle representing never ending cycles of the natural order, harmony and balance, a cyclical journey without end, signifying the beginning and continuously unfolding renewal and fruition of all things. Inside the circle, four pillars exist in the form of love, truth, wisdom and, relations each assigned with guardians.

The entrance, the doorway is aligned to the east. It is the portal to the ceremonial sacred space and activities, signifying entry into the womb of Mother Earth, the sacred generative space of potentiality. The Center is the source, the umbilical cord which connects all from the dark unknown world of unlimited potentiality to the world of light and consciousness. It connects us to the core energies of the earth and an enhanced awareness of place. Ongoing, a model of technology is offered.

#### Virtual Kiva – Native Science Academy

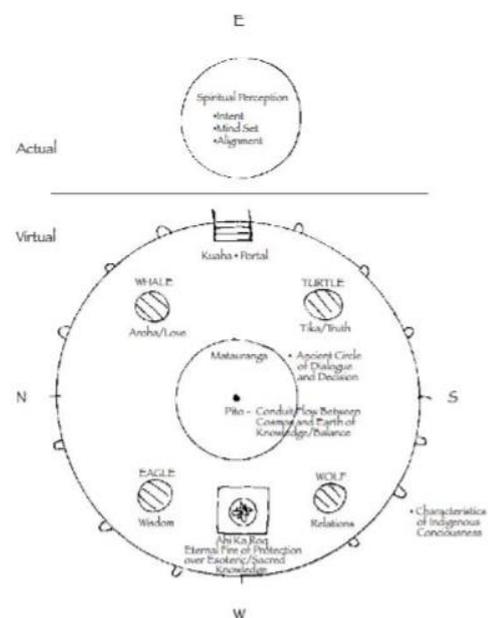


Fig 1: The Virtual Kiva (Thater-Braan, 2007 p.11)

In summary, it may be possible to match an indigenous understanding of the artefact construction termed as constructs, models, methods and instantiations to a physical layer of building the IT artefact. To this end, construction layers of processes used to encapsulate the intellectual requirements of the indigenous mentality during construction could involve:

- **Constructs** - the artefact *symbols, patterns, terminology and languages* are uniquely characterized to the indigenous community involved in the artefact construction.
- **Models** – *events* that can be characterized as being truthful or not. The knowledge holder is able to make connections to the world “as it appears” to exist to the indigenous community concerned.
- **Methods** – the *method* is recognizable and uniquely attributed to the indigenous community involved with the artefact construction. The emotional attachment to the artefact, the spiritual connection to the artefact, the physical form of the artefact is presented as knowledge transferred using indigenous formats such as story-telling, navigating the universe/ planet, songs and, crafts alike.
- **Instantiations** - based on the notion knowledge holders are aware of *symbols, patterns, terminology and languages*, are able to connect the existence of known *events* using a *method* that is uniquely indigenous by nature.

## 5. THEORETICAL ARTEFACT

As an artefact, five layers are revealed from the literature review as variants between western and indigenous research consisting of (1) a *framing layer* adopting an indigenous purpose towards the artefact construction, (2) a *relationship based layer* towards the artefact construction based on rapport and trust, (3) an *engagement layer* that opens access to the artefact construction activities adopting the unique and familiar, (4) a *discovery layer* that leads the way the artefact construction is observed and ordered. This layer involves the indigenous state of conscious thought linked by intuition and suggestion, (5) a *construction layer* that initializes the artefact lifecycle construction link between the physical and the digital.

When successfully stated, Fig2: The indigenous IT artefact model depicts a sense of indigenism, an indigenous construction framework that specifically inherits indigenous ways of doing ‘*as it appears to exist*’ to the indigenous community concerned during the IT artefact construction.

Indigenous artefact construction map

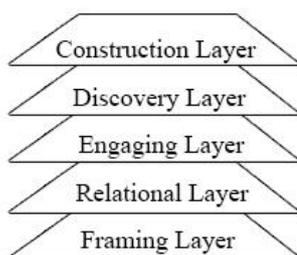


Fig 2: The Indigenous IT artefact model

The artefact reveals a set of layers intended to guide practice during the construction of the indigenous IT artefact.

1. The **framing layer (platform of indigeneity)** philosophy and terminology that involves the views of the researcher’s narrative (who am I as a researcher), researcher’s intentions (what am I seeking as a researcher), the researcher’s genealogy and cosmological connections to the planet (how do I exist as a researcher) thereafter the philosophical approach and terminology adopted and framed as being indigenous.
2. The **relational layer (rapport with indigeneity)** building rapport and relationships that involves engaging with protocols based on indigenous practice and process. A layer employed to establish trust during research and social considerations based on required protocols to entry, language, customs, knowledge of world views both indigenous and technology.
3. The **engagement layer (validating indigeneity)** Involves the unique characteristics of the indigenous community towards research involving consents (can I?) Includes the unique characteristics attributed to the indigenous community concerned. Feedback and reporting loops are involved (who, what, when, where, why) using a language and framework familiar to the indigenous community.
4. A **discovery layer (observation and order of indigeneity)** Seeks the unknown employing an approach that is fixated on contributions to both the indigenous community and indigenous knowledge. Creating meaning from chaos building an awareness of the available solutions ‘as it appears to exist’ to the indigenous community concerned such as visiting mythology past-time stories and available knowledge from knowledge holders. Depicting the way research will be performed (methodology) during the artefact construction. Asks different questions based on the relationship and obligations towards construction knowledge required. Offers rounds of artefact suggestion and possibilities.
5. The **construction layer (IT in indigeneity)** The indigenous IT artefact asks different questions based on the known connections. The result of events adopting terminology, symbols, patterns, and a language using an indigenous methodology ‘*as it appears to appear*’ to the indigenous community concerned.

## 6. EVALUATION

The study takes a generalized approach towards building indigenous knowledge that is theoretical and, is positioned as an early phase research activity. Indigenous research is the space that represents the problem posed which impacts upon the community under research.

The research question is - can there be a set of indigenous practices and processes applied to the construction of the indigenous IT artefact. In response, the indigenous IT artefact is based on the notion, knowledge holders are able to adopt *terminology, symbols, patterns, and languages* to connect the existence of known *events* using a *method* that is uniquely indigenous by nature.

The theoretical artefact represents a model that explicitly prescribes (when) the timing of events occur as layers of the model provided, (what) tasks are required and, (who) may be involved during the construction of the indigenous IT artefact. However, no effort was completed in regards to (where) the construction of the IT artefact may occur alluding to an indigenous space involving location and (how) construction may occur left open for further research within the discovery layer of construction.

Evaluation activities are mostly concentrated on the process map provided. These activities are centrally linked against two stages of the indigenous IT artefact construction. The first stage ex ante employed during the design process of the artefact. This stage considers the artefact construction during preparation which involves, framing, relational, engagement and discovery phases of creation. The second stage ex-post adopted during the actual build of the indigenous artefact considers the involvement of constructs, models, methods and instantiations.

A Constructivist approach is revealed as a practical world view paradigm that suits the connection of the artefact to an indigenous world view during research. This form of study is interpretive and interested in providing resolution to problems which may benefit the indigenous community concerned. New knowledge is discovered whilst old knowledge may be stored in repository as a result of a constructive approach. The Constructivist view consist of not just the one reality (be it fixed or fluid), but there may be multiple realities that can be socially constructed based upon the reality perceived 'as it appears to exist' to the indigenous community involved in research.

A scan of literature linked to the technical process of the indigenous artefact pre and post construction offered only a limited number of publications that resembled an indigenous framework of technology construction. The research turned to published work of indigenous researchers to assist with a platform and direction of research. The result is a prescribed process map in theory that represents the combined efforts of literature, reviewed as a model to lead practice.

## 7. DISCUSSION

Explicitly outlining indigenous practices and processes, creates an understood reality where each play an active role in a collaborative manner, creating a peaceful yet separate co-existence when employing indigenous knowledge as an approach towards constructing the indigenous IT artefact. However, this approach creates the opposing challenge of 'many ways of doing' employing many theories with no central understanding within a global context of research which may take time to fully implement. There is the added risk of adopting a concept of 'we are here to make our own reality and that reality is what-ever we choose it to be'. The model provided Fig2, opens future opportunities for researchers interested in further inspection such as:

- The logical and physical construction of the indigenous IT artefact using the modelled map as a design guide towards construction.
- The construction map employed as a communication portal with western research efforts interested in the research construction of the indigenous artefact.
- An indigenous process map used as a topic of analysis connecting the indigenous research community and technology construction community.

Critics of indigenous research have stated contributions to domain theories have been minimal when adopting indigenous research due to the complexity and time involved when conducting such methods. The use of indigenous research only created restrictions and constraints towards theory development due to the broad nature of views making diligence difficult to manage during enquiry creating further problems. Furthermore, if every indigenous community developed their own philosophical reflection towards itself, how many modes of indigenous thinking would have to be developed. It would be impossible to span the globe of indigenous groups creating artefacts in search of knowledge. Firstly, there are too many indigenous communities each with their own unique interpretations, stories and languages and second, generalising indigenous communities tends to create further disconnections and barriers when seeking knowledge about the construction of the artefact.

In response to critics of indigenous research, the final goal of research by indigenous researchers is to develop an indigenous framework engaging with indigenous development, understanding the existence of indigenous knowledge, discussing the purpose of constructing indigenous knowledge

ways, critical analysis of indigeneity, progressing indigenous research, and decolonizing research methodologies in pursuit of indigenism as a framework of research. Any attempts to quantify indigenous research using empirical facts would only result in the water bucket of scientific theory being half full with only partial contributions towards theory development.

## 8. CONCLUSION

The intended goal of this paper was to address the problem statement by adopting a theory based approach to the construction of the indigenous IT artefact. Whilst philosophical and methodology differences may exist between both western and indigenous research during the construction of the IT artefact, the over-riding goal was to build an indigenous artefact that reflects indigenous knowledge best served by adopting indigenous methods specific to the indigenous community concerned.

Five layers are offered as a blue print map outlining 'what currently exists' in pursuit of the opposing availability of 'what doesn't exist' opening ongoing research opportunities to the indigenous research environment in design, development and evaluation of the indigenous IT artefact.

Given the limited amount of research literature connecting the IT artefact to the views of indigeneity, ample opportunities exist in pursuit of an indigenous method of research during the logical and physical stages of the IT artefact construction.

## 9. LIMITATIONS

Prioritizing the topic of research is complex with a large body of theoretical work required. This paper is a generalized study of the literature and does not claim to have run forums, surveys or field tests opening opportunities for research investigation in the future.

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