Facilitating cooperation in transdisciplinary research and evaluating its role in SenseMaker® for a developing world context

by
Joshua Michael Pylipow

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Supervisor: Prof Mark Swilling
Co-supervisor: John Van Breda

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Declaration

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Abstract

Complex social-ecological issues pose serious threats to global development as their presence permeate borders, ecosystems and cultures. This holds particular precedence in the developing world, where the United Nations anticipates extensive growth over the coming decades. Transdisciplinary research stands as a type of methodology that allows society and academia to jointly address social-ecological issues through eliciting societal changes in thinking and behaviour. This type of research requires sustained cooperation among participants with diverse backgrounds and perspectives. Yet current transdisciplinary research literature offers little insight into the facilitation of cooperation especially in a developing world context.

This paper explores the biological and cultural factors that influence cooperation in order to better understand how it may be facilitated in transdisciplinary research. It incorporates this understanding with observations of training sessions for the narrative-based research tool SenseMaker® conducted in a developing world context to assess how the tool facilitates cooperation and the tool's suitability for the developing world.

The findings reveal that although cooperative behaviour is driven by biological and cultural underpinnings, reflective practice can allow one to overcome otherwise inhibiting perceptive biases in favour of cooperation. SenseMaker® utilises this propensity to create a shared reality among participants through reflective dialogue, breaking down perceptive biases and facilitating cooperation. Its narrative-based approach also seems to diminish the presentation of a classic cost-benefit cooperative scenario, reducing bias-influenced responses and aiding the progress of the research process. These findings cautiously speculate that SenseMaker® may be suited for the storytelling traditions on the African continent as well as around the world, but more research is needed to confirm this.

Opsomming

Komplekse sosiale-ekologiese kwessies is 'n ernstige bedreiging vir internationale ontwikkeling omdat hierdie kwessies nie grense of kultuur ken nie. Sosiale - ekologiese kwessies loop deur alle kulture, grense, en natuurlike sisteme. Hierdie impak is nog groter in ontwikkelende lande waar die Verenigde Nasies groot populasie groei verwag in die komende dekades. Transdissiplinêre navorsing staan as 'n tipe metodologie waarmee die samelewing en die akademiese gemeenskap gesamentlik sosiale-ekologiese kwessies kan aanspreek deur verandering in gemeenskaps denke en gedrag. Hierdie soort navorsing vereis volgehoue samewerking tussen deelnemers met n omvangryke verskeidenheid van agtergrond en perspektief. Tog bied huidige transdissiplinêre navorsing-literatuur min insig in die fasilitering van samewerking, veral in 'n ontwikkelende wêreldkonteks.

Hierdie artikel stel ondersoek in rondom die biologiese en kulturele faktore wat samewerking beïnvloed om beter te kan verstaan hoe dit in transdissiplinêre navorsing gefasiliteer kan word. Dit inkorporeer hierdie begrip met waarnemings van opleidingsessies vir die narratief gebaseerde navorsings instrument SenseMaker®. Hierdie opleidingsessies is in 'n ontwikkelende wêreldkonteks uitgevoer word om te bepaal hoe die instrument samewerking fasiliteer asook of SenseMaker® geskik is vir die ontwikkelende wêreld.

Die bevindinge wys dat al word samewerking gedryf deur kulturele en biologiese faktore, kan bedenkig en reflektiewe praktyk die individu toelaat om hulle eie vooroordeel raak te sien te gunste van samewerking. SenseMaker® maak gebruik van hierdie geneigdheid om 'n gedeelde werklikheid onder deelnemers te skep deur reflektiewe dialoog, perseptiewe vooroordeel af te breek en samewerking te fasiliteer. Hierdie narratief-gebaseerde benadering verminder die gebruik van ‘n klassieke kostevoordeel-koöperatiewe model, verminder die invloed van vooroordeel op besluite en dryf bevordering van ‘n navorsings prosses. Hierdie bevindings stel versigtig voor dat SenseMaker® geskik is vir die storievertelling tradisies op die Afrika-kontinent, sowel as regoor die wêreld, maar meer navorsing is nodig om dit te bevestig.

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List of Acronyms and Abbreviations

CST	Centre for Complex Systems in Transition
SDGs	Sustainable Development Goals
SDI	Slum/Shack Dwellers International
TDR	Transdisciplinary Research

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Chapter 1 – Introduction

1.1 Background

The rapidly changing state of the planet has prompted the world to take a self-critical stance of its impact on the environment. Human activity causes ten times more soil erosion than all other natural processes combined (Wilkinson 2005), coral reefs are quickly fading and may disappear by 2050 (Hoegh-Guldberg, Mumby, Hooten, Steneck, Greenfield, Gomez, Harvell, Sale, Edwards et al. 2007), and poverty and hunger still persist despite decades of eradication efforts. These challenges are highly interdisciplinary, interconnected and constantly evolving with unpredictable new emergent properties (Heylighen, Cilliers & Gershenson 2007; Rockström, Steffen, Noone, Persson, Chapin III, Lambin, Lenton et al. 2009; Becker 2012; Audouin, Preiser, Nienaber, Downsborough, Lanz & Mavengahama 2013).

The range of globally pressing issues has elicited governing bodies of the world to take action. In 2000, the United Nations released the Millennium Development Goals as an attempt to address some of these issues. The eight goals widely concerned social issues including poverty, disease, and education (UNDP 2015). The success of this program over the course of its fifteen-year lifespan led to the Sustainable Development Goals (SDGs) in 2015. This expanded strategy built off the Millennium Development Goals by including more detailed aims concerning improving the state of the global environment and economy (UNDP 2015). In addition to eradicating poverty, the goals address pursuing clean energy, environmental stability, and sustainable communities and cities.

Expanding on the Millennium Development Goals, the Sustainable Development Goals (SDGs) target global development as seen in Figure 1. Nevertheless, with over 1 billion people on the African continent, the large majority of the continent's fifty-four countries are grouped into low human development indexes (UNDP 2016). Of the 2.4 billion-person-increase in expected worldwide population by 2050, fifty-four percent is expected to be concentrated in African cities (United Nation Department of Economic and Social Affairs-Population Division 2015). The coming decades will require a substantial amount of trans- and intercontinental cooperation in order to ensure that the goals are strategically targeted for the context for which they were designed.

Figure 1: Sustainable Development Goals. *Source: UNDP 2016*

Of the seventeen goals, the last goal is unique in that it serves as perhaps an under-appreciated cornerstone for facilitating the other goals. Ending poverty and hunger, promoting economic development, and improving climactic conditions will never happen on a global scale unless the people and nations of the world are actively working toward them together as the seventeenth goal 'Partnerships for the Goals' embodies. This goal highlights the necessity of intercultural cooperation in working toward the SDGs as the interwoven complexity of the world's challenges extends beyond that of individuals or single nations. For example, overfishing in China does not just affect Chinese citizens (Boonstra & Österblom 2014). The problem is a part of a social-ecological system that creates resonating repercussions for the environment, economies, and societies the world over. Global cooperation is crucial to facilitating the SDGs (Sachs 2012).

Yet cooperation is not so easy to facilitate. Culture clashes and conflicting rationalities stand in rigid opposition (Watson 2003; Conner & Markus 2013). Groups of different belief systems, values, and norms carry ideologies that can be very opposing to their neighbours'. The brevity of this global challenge is increased through acknowledging that culture clashes not only concern groups separated by large distances or even international boarders. Proximate geography, socio-economic status, and even dialect can separate different cultures and consequently their associated value systems (Inglehart & Baker 2000; World Value Survey 2016).

Despite cultural differences, the SDGs and the future of the planet require an approach that empowers society to take responsibility for its actions and contribute to the efforts of global endeavours. Yet these efforts must be well informed to sufficiently address the

issues associated with complex social-ecological systems (Rockström et al. 2009). While traditional approaches in science have undoubtedly contributed to humankind's body of knowledge and to the planet, they have historically lacked sufficient effectiveness in tackling complex social-ecological issues arguably due to a lack of sufficient societal involvement (Hadorn, Biber-Klemm, Grossenbacher-Mansuy, Hoffmann-Riem, Joye, Pohl, Wiesmann et al. 2008).

Transdisciplinary research (TDR) is a cooperative type of science that allows for these issues to be better addressed through generating and exchanging knowledge between scientists and practitioners in an adaptive capacity (Hagemeier-Klose, Beichler, Davidse & Deppisch 2014). As an emerging methodology for doing science, TDR focuses on tackling complex problems not through single scientific disciplines, but through open collaboration among various disciplines *and* with societal actors (Burger & Kamber 2003; Stokols, Hall & Vogel 2013). The narratives that emerge from these discussions help to break down complex problems by contextualizing them. In contrast to a linear or top-down approach, this methodology is inclusive, treating both theoretical and practical knowledge as having equal value (Stokols, Hall & Vogel 2013). This approach has shown potential in addressing complex social-ecological issues (Brandt, Ernst, Gralla, Luederitz, Lang, Newig, Reinert et al. 2013).

However, the methodology would still benefit from further exploration. Cultural context holds a significant role in the TDR process, and requires more emphasis (Lang, Wiek, Bergmann, Stauffacher, Martens, Moll, Swilling & Thomas 2012). This is especially relevant considering the ability of culture to influence cooperative behaviour (Gächter, Herrmann & Thöni 2010). Although cooperation is central to the TDR process, TDR models little explore the factors that facilitate it. Additionally, most studies on TDR come from the developed world, which is not so easily transferable to a developing world context (Van Breda & Swilling 2016). This leaves a gap in understanding how cooperation may be better facilitated in TDR especially for the developing world (Hollaender, Loibl & Wilts 2002; Walter, Helgenberger, Wiek & Scholz 2007; Godemann 2008).

SenseMaker® is a narrative-based research tool that emphasises cultural understanding through reflective dialogue (Zhen 2017a). It brings academia and societal stakeholders together to co-produce and disseminate knowledge, allowing the societal stakeholders to shape and interpret the findings of the process. Understanding the role cooperation holds in the SenseMaker® process may serve useful for advancing the field of TDR. As the African continent is a major target for the United Nation's Sustainable Development Goals (UNDP 2016), TDR would benefit from more attention in an African context.

1.2 Rationale for the Study

TDR is a relatively young but promising methodology for addressing some of the world's most complex issues. While the field is still growing, it seems to lack direction let alone a definite understanding of how it works and is practiced. Exploring the cooperative aspect of TDR seems useful in contextualising core components of the methodology. Cooperation must occur throughout the entire process in order for TDR to be successful. This inherently requires a consolidation of values, beliefs, and goals. Culture, however, is not so easily influenced, yet it holds a large role in our decision-making. The gap in TDR literature regarding cooperation consequently could benefit from exploration.

1.3 Problem Statement

TDR serves as a useful methodology in addressing the types of complex issues that the SDGs attempt to address. Yet the methodology depends on cooperation across stakeholders from varying cultural backgrounds. However, the role of culture seems to be an underrated yet highly influential variable in pursuing social change. It shapes perception and consequently affects behaviour. In the pursuit of the SDGs, cooperative behaviour across the countries and cultures of the world will be instrumental in the endeavour's success. Yet the TDR literature offers little insight regarding these topics. There does not seem to be enough contextual-based TDR methods for the developing world and more specifically, continental Africa. The continent is a major target for the United Nation's SDGs, yet its complex social and economical climate is one of a kind. TDR methods designed within and for a developed world context may not serve as beneficial to the developing world.

1.4 Research Questions

1. How might cooperation be facilitated in the TDR process?

2. Is SenseMaker® able to facilitate cooperation and if so, how?

3. Is SenseMaker® useful as a TDR method for a developing world context?

1.5 Overarching Research Approach

The Centre for Complex Systems in Transition (CST) of Stellenbosch University has partnered with the NGO Slum/Shack Dweller's International (SDI) in order to explore the potential of SenseMaker®, a narrative-based research tool developed by Cognitive Edge. The tool is based on David Snowden's (founder and CEO of Cognitive Edge) work in narrative research and complex adaptive systems theory.

I aim to explore the social aspects rooted at the core of the TDR process including cooperation, culture, motivation and reflection through a literature analysis. Through the framework that emerges, I intend to document the four stages of the SenseMaker® process using this framework. I plan to document the SenseMaker® process as it is rolled out by SDI, which can be broken down into four steps: 1) co-designing the interface 2) collecting stories 3) analysing the stories and data and 4) returning the stories to the communities from which they were collected. I intend to shadow SDI as they use the tool throughout these stages in their attempt to successfully introduce 'clean cookers' into various communities across Africa. These cookers would run on renewable energy and reduce the need for paraffin or wood. Tracking the use of the SenseMaker® tool must be abductive in nature. This will allow me to explore what kind of transformative effects emerge from the work of SDI.

This thesis explores cooperation in order to understand how it may be better utilised in TDR. It attempts to connect the influential nature of perception on cooperative behaviour, and explores the potential of reflective practice in overcoming perceptive biases. Using

this lens, I explore the potential of SenseMaker® as a TDR tool that is created in and for a developing world context through documenting its process and exploring the role of cooperation in it.

1.6 Delimitations of the overall study

Regarding the literature analysis, I intend to unpack cooperation in order to understand how it may be better facilitated in the TDR process. In doing so I will explore the roles of culture and reflection in affecting cooperation. I acknowledge that there are other cognitive phenomena that hold roles in how we interact with others. This research does not intend to model or necessarily explain how cooperation manifests itself in the human brain. Rather, it will attempt to explore the role it plays in TDR and through this understanding, how it may be better facilitated. Cooperation shall be defined as the process of working together to meet a common end.

As for SenseMaker®, SDI intended to rollout its slow cooker program in Accra, Cape Town and Kampala. As I am based in Cape Town, my ability to track the progress of the program in the other cities was limited to a lack of funding for travel. Additionally, due to the limited timeframe of this research, SDI's entire rollout of SenseMaker® was not documented. However, the insights from the training sessions provide useful information to examine the SenseMaker® process.

1.7 Chapter Outline

The paper will first explore the nature of TDR and its need in pursuing the SDGs. It will then discuss the importance of cooperation in TDR and consequently unpack the concept. It will look at the biological underpinnings of cooperation, the role of culture in influencing cooperative habits, and the ability of conscientiousness to facilitate cooperation.

The paper will then discuss the background of the SDI project, explain the characteristics of SenseMaker® and the journey of their project over the course of the year. It will then analyse the SenseMaker® process through the framework developed in the literature review emphasising the importance of the reflection-inducing nature of the tool.

Finally, the paper will return to the three original questions posed in this chapter and answer them. A brief critique of the answers will follow as well as recommendations for future research.

As the paper draws on a range of different disciplines, I have conscientiously avoided jargon/technical terms when possible in order to increase the accessibility of the paper.

Chapter 2 – Literature Analysis

2.1 Introduction

There is an ever-increasing need for TDR approaches to address complex societal issues especially those related to sustainability (Lang et al. 2012). Yet most TDR has been based in a Northern hemisphere scientific and cultural context with limited discussion regarding developing countries (Hurni, Wiesmann & Schertenleib 2004; Van Breda & Swilling 2016). The field is also still relatively young facing issues in facilitating lasting cooperation among participants (Hollaender, Loibl & Wilts 2002; Walter, Helgenberger, Wiek & Scholz 2007; Godemann 2008). As the analysis will explore, cooperation is an instrumental component of TDR, yet its exploration is seemingly underappreciated in the literature.

This paper explores the modern day need for TDR in solving complex social-ecological issues, emphasising the importance of cooperation in the process. It draws on research in evolutionary biology attempting to bridge the work by Dawkins (2016) and Margulis & Sagan (1997), going on to propose six rules of cooperation based largely on Nowak (2006) that serve as the groundwork for cooperative behaviour in society. The paper then goes on to link the influences of evolutionary psychology and culture on our perceptions of others and how these perceptions influence our willingness to cooperate based on the work of Gächter, Herrmann, and Thöni (2010), Conner and Markus (2013), and Sapolsky (2017). It finally draws on Nehring, Laboy & Catarius (2010) among others to discuss the role of reflection in the TDR process and how it allows us to willingly shift our perceptions in manners to facilitate cooperation, aiding the TDR process. This is a relatively new and slightly philosophical approach in attempting to connect some of the biological, cultural and psychological influences in human behaviour with facilitating TDR. This exploration may serve beneficial in the development and understanding of the field and in the creation of future TDR tools.

2.2 Methodology and methods

The paper included a range of peer-reviewed literature from biological sciences to social sciences. Papers and books were selected from the library services provided by Stellenbosch University as well as from this author's own books. The paper only includes publications in English. The language of this paper is intentionally formatted to avoid jargon, when possible, given the range of fields that this research covers in an attempt to make the document more accessible.

The approach explores the factors that can influence cooperative behaviour and its relevance to TDR including evolutionary psychology, culture, and reflection. This does not mean to imply that these are the only components necessary to facilitate the TDR process. Although the framework may seem straightforward, it acknowledges that its lens is not omnipotent. Other factors likely influence the ultimate success of a TDR project such as governmental structures (Brandt et al. 2013).

2.3 Analysis

2.3.1 Cooperative research for a complex world

Science has traditionally acted as an intermediary between what occurs in nature and how society understands it (Hadorn et al. 2008). This newfound knowledge ideally empowers society to improve itself and its environment (Hadorn et al. 2008). While traditional research approaches in science provide knowledge that can transform the world, these approaches also bare an unfortunate challenge: those who are not involved in science or are not 'science-literate,' struggle to make sense of scientific interpretations of the world. This can have a polarizing effect creating cognitive dissonance, an explanation for the surprisingly large group of climate-change deniers in the world (Burnes & James 1995; Whitmarsh 2011).

For example, while ninety-seven percent of the scientific community agrees that the level of climate change that the world has experienced is caused by humans (Cook, Nuccitelli, Green, Richardson, Winkler, Painting, Way et al. 2013; Benestad, Nuccitelli, Lewandowsky, Hayhoe, Hygen, van Dorland & Cook 2016), key contributors to annual, global CO2 emissions like the United States and China are some of the least concerned about climate change (Stokes, Wike & Carle 2015). Forty-five percent of Americans and only eighteen percent of Chinese think climate change is a very serious problem, in contrast to Latin American and Africa at seventy-four percent and sixty-one percent respectively. In fact, only about one in eight citizens of the United States understand there is scientific consensus (ninety percent or more) on human-caused climate change (Leiserowitz, Maibach, Roser-Renouf, Rosenthal & Cutler 2017). This disparity, if left unchecked, could be detrimental for the SDGs.

Researchers have traditionally taken a number of approaches in attempting to address complex issues like climate change. Mono-disciplinary research, for example, describes individual disciplines that work separately on societal problems (Hollaender, Loibl & Wilts 2002). Multidisciplinary research broadens this idea describing individual disciplines that work separately on the same issue. However, interdisciplinary research goes further to describe when disciplines begin to collaborate as they work on the same complex issues. While these approaches have no doubt contributed greatly to science and society and will continue to be essential parts to both, they tend to neglect a vital realm of knowledge crucial to addressing complex societal issues- that of society itself (McGregor 2004.).

The Cynefin framework describes different levels of complexity involved in solving different types of problems, which may be useful to demonstrate how the traditional scientific approaches differ from TDR (Snowden & Boone 2007). To elaborate, mono-disciplinary research is useful in solving obvious problems that have a linear cause-effect relationship. For example, if a marine biologist wants to research the population of sharks near a costal community, they may only need their own discipline to address this question.

Multi- and inter-disciplinary research methods are useful in solving problems that have multiple cause-effect relationships. While their outcomes are more difficult to predict, they are still predictable. If the population of sharks near the coastal community is rapidly

declining, then biologists, oceanographers, climate scientists and economists may need to collaborate to find out why.

TDR attempts to address problems with non-linear cause-effect relationships, which are characterised by their unpredictable, emergent properties (Hadorn et al. 2008). If the population of sharks is rapidly declining due to overhunting by the coastal community, which is driven by the demand of for shark fins in another part of the world, then biologists, oceanographers, and economists may need to collaborate with the community, governments, and NGOs to not just understand how the social-ecological system may change, but to also jointly develop pragmatic solutions that empower the community to address the issue.

As social-ecological problems are inextricably linked to society, society's input into addressing their problems is essential. Core to the TDR process are 4 fundamentals: transformation, collaboration, integration, and innovation (Hollaender, Loibl & Wilts 2002). These cores support TDR in holding theoretical and practical knowledge equally in co-producing new knowledge between stakeholders and academia in such a way that allows them to not only understand complex societal issues, but also to solve them together. Society is a key contributor to TDR, which makes it a useful methodology for addressing complex social-ecological issues as society is inextricably linked to them.

TDR has been widely explored and implemented in the developed world (Brandt et al. 2013). The field is rapidly growing as its application becomes more apparent and its solutions more desperately needed. A wide variety of definitions and uses exist for TDR, perhaps showcasing the approach's infancy. Some organisations such as the Swiss Academy of Sciences, however, are attempting to compile TDR tools into a 'toolbox' in an effort to advance the use and development of TDR methods (Sciences Switzerland 2017). While this is useful in aiding in the growth of the methodology, it does not offer much insight as to the usefulness of its methods in the developing world (Van Breda & Swilling 2016).

Africa is an expansive and diverse continent of cultures with lingering memories of its colonised history that has left its people with a range of perspectives and feelings about its rapidly changing economic, environmental, and social landscape. Its challenges in addressing population growth, persistent poverty and inequality all the face of climate change presents the continent and its peoples with a unique challenge over the coming decades. In order to address these, they must manage to overcome conflicting rationalities and culture clashes (Watson 2003; Conner & Markus 2013).

Despite different cultural backgrounds, values and perspectives among the variety of participants in TDR, they must work together to solve real-world problems (Hollaender, Loibl & Wilts 2002; Walter, Helgenberger, Wiek & Scholz 2007; Godemann 2008). Consequently, cooperation in TDR plays a crucial role, particularly among the differing disciplines in academia as well as between academia and society. Given the juvenility of the field, most TDR literature offers little to no explanation on the facilitation of cooperation. As there is not an abundance of evidence of TDR methods successfully used in a developing world context, it is difficult to attempt to describe the ideal characteristics of such a method. Consequently, exploring the factors that influence cooperation may yield insight into how it may be better facilitated in TDR.

2.3.2 The genes of cooperation

Cooperation holds a central role in the survival and social success of humans (Buss 2015). From an early age, we are taught to get along with our classmates, which later helps us create business networks, perform in symphonies, and attempt to solve global issues. Cooperation helps to build trust, which is vital aspect of TDR (Walter, Helgenberger, Wiek & Scholz 2007; Gambetta 2008). However, a great deal of anti-social behaviour exists in society as well. People seemingly neglect the poor, the famished, and the outcast, and they refuse to make self-sacrifices if the inconvenience is too great (Rand & Kraft-Todd 2014). The simultaneous presence and absence of cooperation in society seems to be paradoxical, despite its seemingly obvious broader advantages.

To explore this dichotomy and begin to understand how it applies to TDR, it is useful to explore the grounding for pro-social behaviour. In his original 1973 essay, evolutionary biologist Theodosius Dobzhanksy made his famous title statement, "Nothing in biology makes sense except in the light of evolution" (Dobzhansky 2013). This approach is just as applicable in understanding the drivers of cooperation.

Genes are the unit of biology, and it is their existence that constructs the basis for everything we are and can be (Dawkins 2016). From a genetic perspective, genes produce organisms, which genes use to replicate. The more successful any organism is, the more likely the genes of that organism will successfully replicate. While this view may seem rather apathetic, humanity and life in general owe their existence to the interactions of genes, and it is in fact their nature that has lead to the existence of cooperation. Acts of cooperation by organisms can 'help' copies of genes replicate. If cooperative behaviour is favourable for the organism, then the genes that influenced the organism to cooperate at all may be passed on to successive generations. This behaviour is described as altruism serving as the foundation for cooperation (Dawkins 2016).

This is, however, highly contextual as cooperation only works when others cooperate (Nowak 2006). In some species, anti-social behaviour is advantageous. For example, the octopus is the most complex and intelligent invertebrate with the furthest common ancestor to humans- the closest thing to an alien on this planet (Godfrey-Smith 2016). Despite their cognitive abilities and display of cultural habits similar to ours, they are largely non-cooperative and sometimes even cannibalistic (Godfrey-Smith 2016). However, if the genes of an independent octopus were to influence the behaviour of the individual to act cooperatively and attempt to befriend another octopus, the act would likely end in its own demise for this type of behaviour would not be suitable for its environment. If genes produce an organism that is not suited for its environment, then those genes are not likely to propagate in successive generations, guiding gradual changes in the species (Dawkins 2016).

While this topic could be expanded greatly, I am intentionally only laying down the essential, foundational aspects as to avoid losing audience. As stated in Chapter 1, the approach of this literature analysis is such that it avoids jargon as its potential readers may not be well versed in the range of disciplines that the paper explores.

2.3.3 Creating a complex world

Yet Darwinian approaches to evolution sometimes distort the catchphrase of 'survival of the fittest,' such that evolution is viewed as a perpetual battle of life (Margulis & Sagan 1997). However, the catchphrase simply embodies the idea that selective pressures guide evolution. The fittest organism is one that is best suited for its environment and that can often require cooperative behaviour even across different species. Although it leads a solitary life, the blue-ringed octopus has evolved to have a close relationship with a type of toxin-producing bacteria that allows the octopus to protect itself with a venomous bite while providing solace for the bacteria to grow and propagate in return (Sheumack, Howden, Spence & Quinn 1978). These types of interactions across organisms and species amount to selective pressures that influence the evolution of each other (Dawkins 2016), and even larger changes may occur when organisms of distantly related species are able to create a single descendant (Margulis & Sagan 1997). With this in mind, it becomes easier to imagine the innumerable interactions and dependenices among the diverse spread of life on the planet.

Although genes are the building blocks for life, the emergent properties that surround life are due more credit for the world they has shaped. Complex chemistry in action leads to the emergent property of genes (Ross & Arkin 2009). The interactions of genes lead to the emergent property of life. The interactions of life and its environment lead to the emergent property of a dynamic, self-regulating biosphere (Lenton 1998). This biosphere consequently selects for cooperation (Lenton 1998), which ultimately returns to the selection of organisms and their genes. This displays the emergent characteristics of life (Margulis & Sagan 1997; Dawkins 2016). Life has created conditions that are conducive to life, creating a global, dynamic network of biotic and abiotic interactions. The relatively recent emphasis on Earth science embraces this concept as its understandings and applications become more relevant to a rapidly changing planet (Rockström et al. 2009).

2.3.4 Six rules of cooperation

TDR however deals with people- not genes, evolution or octopuses. While an evolutionary perspective serves useful in conceptualising the nature of cooperation and considering our place on the planet, a more pragmatic approach to cooperation is needed to understand how it manifests itself in our lived experiences and in TDR. The current understanding of cooperative behaviour among humans allows it to broadly be described with six rules.

People help their kin
When food is scarce, a parent will often ensure that their children are fed even before they are. Parents go to great lengths to give their children the best opportunities then can, as this behaviour quite obviously aids in the progression of the species (Nowak 2006). However this rule is not just limited to relatives. The sociality of our species extends this behaviour to those with whom we are close as well, such as our friends (Holland 2012).

People help those who have helped them
However, people do not just make sacrifices for only their kin. They do it for associates and even strangers. This may occur when there is an immediate gain attained through cooperation by those involved (Roberts 2008). An exchange of goods between

individuals offers an immediate benefit to both individuals no matter if they are related, for example. On a more attitudinal basis, I may offer to buy a colleague lunch in remembering that they have done the same for me. In mimicking each other's behaviours, we attain a mutual benefit.

People who have been helped are more likely to help others
However, not all types of cooperation are as straightforward. For example, an act of altruism may influence the receiver to later act altruistically toward others (Nowak & Roch 2007). If someone holds the door for you, you may be more inclined to hold the door for someone else. This type of behaviour has been linked to the development of moral systems (Alexander 1987), and is important for facilitating cooperation in groups in general.

People help those who help others
As another variation, an act of altruism may lend a deferred benefit to the actor. Here, an individual acts altruistically, making it more likely that they receive an act of altruism in the future (Roberts 2008). As our species heavily relies on cooperation for survival and social success (Buss 2015), this offers a reason as to why it can be beneficial to develop a reputation of being cooperative- people help those to help others. This rule along with the former may form a cycle within the species that can create a pro-social environment (Trivers 1971).

People who help cluster together
Our proximity and number of individuals to us who will potentially benefit from our altruism also affects our likelihood of cooperation. In other words, cooperative individuals tend to cluster together. This explanation is purely from a biological standpoint (Nowak 2006), and does not need the assistance of culture as an explanation Nevertheless, culture can influence this type of behaviour as explored in 2.3.8.

Groups that help each other outperform groups that do not
Of the same vein, groups who cooperate will more likely succeed than groups that do not (Nowak 2006). This speaks more broadly to the power of networks, which is an important aspect of TDR. Networks help individuals connect with new people as they build ties to new institutions (Walter, Helgenberger, Wiek & Scholz 2007).

At the core of these rules, those making sacrifices benefit from their sacrifice in one-way or another (Axelrod 1984). A parent sacrifices for their children because they want to see their progeny succeed. In societies where there are repercussions for not cooperating (think: laws and punishments), individuals often forego selfish behaviour, as the repercussions outweigh the benefits of selfish acts. Stealing from my neighbours may bring swift benefits to myself, but at the large risk of being caught and socially ostracised from my community. As social creatures that heavily rely on relationships with others, selfish risks rarely pay off (Buss 2015). This is not to say that these six rules are maxims without exceptions as other factors can influence cooperative behaviour (see: 2.3.8 and - only that they are driven through biology and act as outlets for cooperative behaviour.

2.3.5 Us vs Them, or an origin for bias

Yet the six rules of cooperation depend upon how individuals view each other (Buss 2015). Although a rule suggests one might be willing to help someone that helps others,

this is based on the presumption that the individual with a cooperative reputation is not viewed as a 'threat.' In other words, sacrificing individuals need to feel like their cost for facilitating cooperation will pay off for them (Rand & Kraft-Todd 2014). If individuals are asked to cooperate with those that they perceive as foreign, then they may see the personal cost of the cooperation as too great (Sapolsky 2017). This primitive instinct is rooted in evolutionary psychology. Our brains instinctively label others as either one of 'Us' or one of 'Them' (Sapolsky 2017). Unsurprisingly, we are very open to those we view as one of Us and are typically closed to those we view as one of Them. Thus perceptions can interfere with the facilitation of the six rules.

Some evidence suggests we begin to form a sense of Us-Them from as early as 3 months old, when infants begin to classify faces by gender and race (Kelly, Quinn, Slater, Lee, Gibson, Smith, Ge et al. 2005). Babies show a visual preference to the categories they encounter most often during their waking hours. By 9 months of age, infants lose the ability to as easily distinguish among faces of races they less often encounter. Experiencing some categories more than others may affect how we process those categories differently. Consequently, if left unacknowledged, these perceptive biases can remain with us throughout our lives.

Yet this hard-wired response to others is a primitive one. As a species, our brains have developed significantly since the days of our Australopithecine ancestors over two million years ago (Harari 2014). While we still carry the psychological baggage of our past, we have also acquired newer cognitive functions that have helped to advance our species. For example, much of neural volume that makes up the difference between Homo sapiens and Australopithecine ancestors is used for interpersonal capacities (Ruff, Trinkaus & Holliday 1997) including empathy, cooperation and language. These, too, may affect our perceptions of others and consequently our willingness to cooperate.

2.3.6 Culture: the glue for cooperation

Throughout most of humankind's evolutionary history, it has barely been in the middle of the food chain, where it rightfully nurtured feelings of insecurity and anxiousness-vestiges of our evolutionary past that are not often associated with apex predators (Harari 2014). Yet the ability to cooperate in large groups has allowed the human species to transcend its position in the food chain to populate the world-over in a relatively short amount of time (Harari 2014). This vastly differs to our primate cousins. Typically, primates are not able to form groups larger than 50-150 individuals, relying on consistent personal contact to maintain these relationships (Harari 2014). Although they have complex social structures, groups larger than this number seem to always split into smaller fractions.

Interestingly, our physical reality now depends on our imagined reality. Our species' ability to not only conceive concepts that we have never experienced but to also convey those ideas to our peers allowed us to develop layers of rich culture more complex than that of our primate cousins, which has acted as a binder in cooperative behaviour (Harari 2014). We are able to exist in both a physical reality and an imagined reality conceptualising ideas with which we never physically interact, such as human rights, laws, nations, corporations, money, religion, etc. and we consequently form societies around them. This would be impossible if we were only able to talk about things we have seen in our physical realty. It was the sharing of our imagined realities that helped to

develop rich culture allowing our species to resist the influences of natural selection (Harari 2014). We did not have to wait thousands of years to develop evolutionary adaptations to an ever-changing world. Culture allows us to transmit new adaptations to our progeny far faster than evolution ever could (Conner & Markus 2013). Herein lies a significant factor that can also influence our perception and consequently our willingness to cooperate.

2.3.7 The complexities of culture

When European settlers arrived in colonial Australia, only 300,000-700,000 hunter-gatherers lived on the continent (Broome 2010). Yet this relatively small number of people organised themselves in 200-600 tribes, each with its own religion, language, and unique culture vastly different from the next. Cultural differences among the tribes fuelled intertribal warfare until the suppression of the aboriginals by rifle-yielding colonialists (Broome 2010). In a more modern context, a provincial government's attempt in South Africa to improve the living conditions of shack-dwellers was inundated with assumptions about the shack-dwellers' culture, which lead to resistance and standstill for any remote possibility of development (Watson 2003). As cultural context holds a significant role in TDR (Lang et al. 2012), it is important to recognise that cultural differences do not exclusively occur across countries and oceans- they can exist across property lines. While these geo-local cultural differences may not be as obvious as intercontinental ones, they can still significantly affect our perceptions.

With a more thorough understanding of the biological underpinnings of cooperation, the role of culture may be better understood. Culture, however, can be a difficult subject to discuss. The blame may be placed upon a number of issues including its lack of units of analysis, lack of boundaries, and intracultural variability (Ross 1997). To elaborate, culture does not exclusively *belong* to the individual or even to groups of people. More holistically, it is a self-reinforcing cycle where culture expresses itself through different lenses of society (Conner & Markus 2013). Individuals interact with each other to create institutions, which embody ideas and values that in turn influence individuals. However, this culture cycle is a dynamic system that is capable of shifting over time. This can occur though resonating changes throughout the culture cycle (Conner & Markus 2013).

Others emphasise the variability of cultural identity (Horowitz 1985). I may be a Ballwinian, a Saint Louisan, a Missourian, an American, or an Earthling depending on where I am, what I am doing and with whom. Yet other factors such as gender, race, social class and belief systems add more levels of complication to the matter. Consequently, with such a variety of frameworks to explore culture, it can be a difficult topic to pragmatically discuss. For the sake of attempting to understand culture's role in affecting perception and cooperation, it may be useful to look at a core component of culture that guides the behaviour of individuals- values.

2.3.8 Diversity in action: culture, values, and cooperation

Differences in cultural views can be traced in the trends of differing values across the world. Values represent our guiding principles and motivations, influencing attitudes and behaviours (Holmes, Blackmore, Hawkins & Wakeford 2012). They are a certain type of fact about the well being of conscious creatures (Harris 2010). Although a wide range of factors influences decisions, values serve as a seemingly invisible force that guide our

lives and shape our morals. Yet values are not ubiquitous across the globe. Countries tend to nurture specific types of values within their cultures based on geographic location and culturally linked components for the region, like religion and language (World Value Survey 2016).

Based on two dimensions of opposing value systems, the World Value Survey compares traditional values like religion, familial ties, and authority with secular-rational values holding opposing preferences on one axis. The other compares survival values like economic and physical security with self-expression values like tolerance and environmental protection. When plotted on an x-y chart as seen in Figure 2, it is clear that countries harbour a range of values that may inherently conflict what the values of others (Inglehart & Welzel 2015).

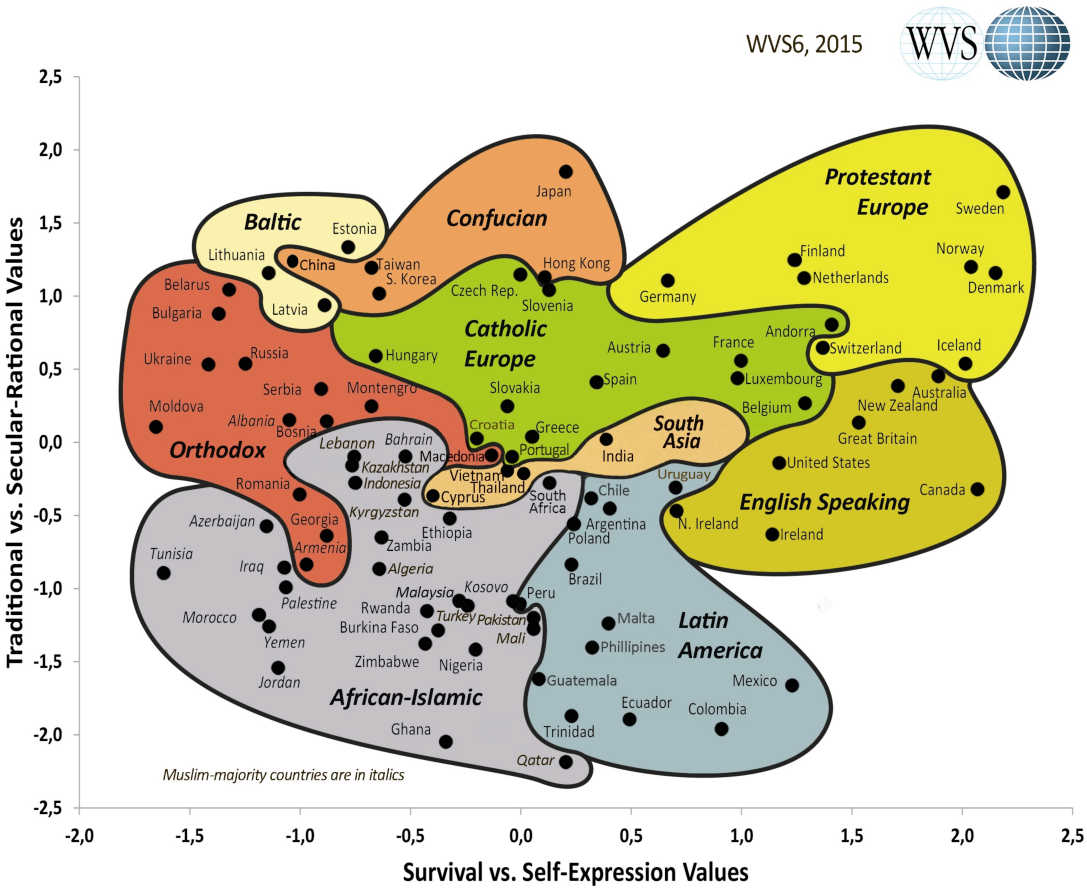

Figure 2: Inglehart-Welzel Cultural Map. *Source: Inglehart & Welzel 2015.*

Just as values vary across culture, how people cooperate generally varies across culture as well (Gächter, Herrmann & Thöni 2010). Embedded institutions within any culture can nourish or repress pro-social behaviour, such as laws and markets (Conner & Markus 2013). However, there are trends in cooperation across cultures such that within-cultural variation of cooperation is smaller than between-cultural variation (Gächter, Herrmann & Thöni 2010). In other words, those who come from the same country or cultural region as described by the World Value Survey are more likely to behave similarly when they are put in a cooperative social dilemma, whereas their behaviour will more likely contrast in the presence of someone of a different culture. The difference in cooperation across cultures is largely due to how each culture deals with those who do not cooperate, which

is a behaviour likely nourished within their culture (Gächter, Herrmann & Thöni 2010). Yet changes in cooperative behaviour do not just vary geographically. Different social groups, such as upper class or working class may also have a large variation in cooperative behaviour between each other (Kocher, Martinsson & Visser 2012). These implications for TDR highlight the complexity in orchestrating sustained cooperation among individuals from differing cultural backgrounds.

2.3.9 Culture and perception: what is your view?

Perception plays a crucial role in the subjective human experience (Varela, Thompson & Rosch 2017), and culture works to shape perception by influencing values, motivations and expectations, which work to create individual life views. Central to discussions in cultural psychology is the sense of self, which is often described through a dichotomy of independent and interdependent senses of self (Varela, Thompson & Rosch 2017). This sense of self, which is shaped by culture, affects how the individual not only views their environment, but also their relationships with others. For example, those with independent senses of self see themselves as authentic, autonomous individuals who enjoy expressing their individuality when working with others and aim at meeting their own needs through group work (Conner & Markus 2013). Conversely, interdependent individuals perceive themselves as a part of a web of relationships, inseparable from others (Conner & Markus 2013). They attempt to aid in the group's collective ambitions, considering the well-being of the group as a whole.

The emphasis on independence in Western cultures and interdependence in Eastern cultures often highlights this dichotomy (Conner & Markus 2013). In addition, other cultural factors can influence the sense of self across scales of dichotomies as well: wealthy-poor, global south-global north, women-men, etc. (Conner & Markus 2013). These senses of self go on to affect crucial social facets in our lived experience, which can affect how we cooperate. For example, if a group no longer serves an independently-minded individual's purposes, the person will be more likely to attempt to change the group or plainly leave it (De Cremer & Tyler 2005). This behaviour could manifest itself in work, leisure, relationships, etc. The interdependently-minded individual, when faced with the same situation, is more likely to attempt to adjust to the expectations of the group, sacrificing personal ambitions if it were to benefit the group as whole (De Cremer & Tyler 2005).

Both views are just as valid as the other, but their oppositeness further highlights the challenges in facilitating intercultural cooperation. While it is irrational and plainly naïve to make assumptions about any particular individual's sense of self, let alone values, based on their background dispositions, some patterns appear when the information is displayed across dichotomies (Conner & Markus 2013). But perspective is not shaped by culture alone. Physiological and other environmental factors may influence perspective as well. However, culture's affect on perception is one that is partially in control of the individual (Varela, Thompson & Rosch 2017).

2.3.10 Language and perception: you see potato, I see earth apple

As the nature of TDR brings people together of differing cultural backgrounds, they often bare differing languages as well. Culture shapes the way we view the world, and language can have a significant impact on that view (Deutscher 2011). One of the most widely recognised and researched examples of this deals with the cultural perception of

colour. Prior to Western influence, a number of isolated cultures around the world interpreted their environments as mostly shades of 'dark/black' and 'light/white' and red (Deutscher 2011). Others like the Himba tribe in Northern Namibia have more names for what I can otherwise only call "shades of green," which they consider individually distinct colours from one another (Deutscher 2011). While it may be easy to brush off these interpretations of colour as deficient and verbose respectively, they serve sufficient purpose to their cultures.

We may be quick to assume that our interpretation of colour, let alone the world, is the right one and consequently what others should adopt as well. Yet making assumptions about what others need, especially those of different cultures, tends to have unfruitful outcomes (Watson 2003). Colour is a continuum that is interpreted by culture. In a sense, we largely only see what our culture allows us to see. One's use of a word or expression of ideas may not convey the intended information to someone of a vastly different culture if they do not have the cultural framework to envision it. The variations of imagined realities in the world can seemingly embody aspects that are completely foreign to others.

Yet cultural interpretation through language does not just affect the perceptions of others; it can in fact affect the perception of those who use the language. Those who have cultural ties to that of any particular language elicit the concept of self that is facilitated by the culture of that language when they speak it (Ross et al. 2002). An individual who grows up bi-culturally learning Xhosa and English in different cultural contexts may express different senses of selves depending on the language they use. This is highly applicable to TDR, where stakeholders may be asked to speak in a language that may elicit a sense particular of self and affiliated behaviour that is not as conducive to cooperation. In considering the breadth of interpretations of shared experiences influenced by merely language, it becomes easier to imagine the diverse perceptions of the world that people may hold.

2.3.11 When your view does not matter

Culture, however, may in fact be able to bypass the six rules of cooperation and in a sense, our perceptive biases all together. Even though cooperative behaviour maintains biological underpinnings (Nowak 2006; Roberts 2008; Sapolsky 2017) there are situations that seem to challenge the six rules. When under pressure or time-sensitive scenarios, those with high levels of inter-personal trust are more likely to act cooperatively over selfishly despite the potential incentives to act selfishly (Rand & Kraft-Todd 2013). Culture can groom cooperative behaviour such that is a fast-twitch instinct rather than a matter to contemplate (Bear & Rand 2016).

Choosing to make a sacrifice because it *feels* like the right thing to do seems counterintuitive to the six rules of cooperation, but cultural influences offer an explanation. Over time, strategies that are typically successful become automated as a default response (Rand, Peysakhovich, Kraft-Todd, Newman, Wurzbacher, Nowak & Greene 2014. If an individual finds that cooperation pays off in the long run, then they are more likely to participate in pro-social behaviour and genuinely care for others (Rand, et al. 2014). This spill-over effect would cause the individual to make pro-social decisions even when it will not explicitly pay off from the perspective of the six rules. While compassion could also play a role in this behaviour, it too varies across culture (Goetz, Keltner & Simon-Thomas 2010). Those who choose to consistently make

personal sacrifices no matter the situation may do so as a product of nurturing the habit throughout their lives (Rand et al. 2014).

This highlights culture's role in habituation cooperation. Conditioning can influence cooperative behaviour bypassing the six rules of cooperation. Although we may feel that our decision to cooperate with friends, relatives or strangers is one stemming from an independent decision of which we had full control, culture has a profound effect in shaping how we behave and think. It influences our willingness to cooperate with others and shapes how we view the world (Varela, Thompson & Rosch 2017).

Stakeholders in TDR each have their own goals and interests in the TDR process including different motivation driving their different perspectives (Walter, Helgenberger, Wiek & Scholz 2007). It is important to recognise that culture has a guiding hand in shaping perception, and that perception can influence our willingness or not to cooperate. Culture also can nourish cooperation through habituation effectively bypassing the six rules. Yet cultural influences do not have the final say in guiding cooperative behaviour, for the awareness of self allows for perhaps one of the most important characteristics of being human- our ability to reflect.

2.3.12 Note to self: reflect

Reflection is a powerful tool that allows us to extract experience out of experience. It allows us to monitor our thoughts, behaviour, and overall state of being such that we can attempt to alter our paths to better fit our values and goals. This introspection enhances our curiosity about ourselves and about our environment leading us to develop and test theories about our preconceptions and assumptions. This lends an important role to reflection as it relates to cultural perspectives, as it may allow individuals to recognise culture clashes in their own lives (Conner & Markus 2013).

The exploration of reflective practice has primarily been limited to its applications in education, healthcare and change management (Moon 1999). Understandably, these fields depend on the change and development of individuals. TDR shares this dependency on reflective practice, yet its literature seems to fail at explicitly addressing this. It may, however, sometimes be indirectly or inadvertently referred to in literature emphasising the importance of the learning process for its ability to empower and motivate (Lang et al. 2012). In the same sense, reflection is critical to the learning process (Thompson 2010).

Especially useful to TDR is the ability of reflection to bridge theory with practice (De Swardt, Du Toit & Botha 2011), similar to how TDR attempts to bridge academia with social practice. In fact, the two fields share very similar discourse:

> "…an active, dynamic action-based and ethical set of skills, placed in real time and dealing with real, complex and difficult situations" (Moon 1999).
>
> "… an intellectual tradition with deep historical roots that cross academic disciplines" (Nehring, Laboy & Catarius 2010).
>
> "…a means by which to fundamentally alter one's beliefs about some aspect of reality" (Nehring, Laboy & Catarius 2010).

Despite their similarity to TDR literature, these excerpts are those of reflective practice literature. The resemblance in discourse is no coincidence. Like reflective practice, TDR attempts to be transformative in its process. In the sense to which it is referred, transformation is facilitated through reflection (Nehring, Laboy & Catarius 2010). Complexity and systems thinking literature also emphasises reflective practice (Heylighen, Cilliers & Gershenson 2007; Audouin, Preiser, Nienaber, Downsborough, Lanz & Mavengahama 2013; Waddock, Meszoely, Waddell & Dentoni 2015), which of course concerns the types of problems that TDR attempts to address.

This transformative power may be demonstrated in reflecting upon this paper, for example. In reading about the nature and mechanisms of cooperation, you as the reader may become more reflective in recognising when they occur in your life and how they affect you. In perhaps having a better grasp of the concept of culture, you may be more apt at recognising when culture clashes inhibit progress in your lived experience, and consequently consider ways to constructively and collaboratively overcome them. This may allow you to reflect on these subjects and consequently categorise them in such a way that allows you to carry a more definitive framework that transforms your views of the world. It is through this reflective process that transformation can take place, and consequently, why it is a centrepiece of TDR.

2.3.13 Bias be gone

Altering perception is a key trademark of reflection (Nehring, Laboy & Catarius 2010; Scharmer 2016). Through reflecting on one's experience, one is able to categorise factors including emotions and assumptions that can lead to developmental insight. For example, a key barrier in inhibiting cooperation is that of the Us-Them mentality. This hardwired dichotomy that we form as social creatures significantly impacts our interpretations of others (Sapolsky 2017).

Yet this primitive response can be easily overcome through acknowledging commonality (Sapolsky 2017). For example, community members in an informal settlement may see a visiting city dweller in their community as an outsider. After all, they likely come from very different cultural backgrounds, which may be expressed through their dress, language, behaviour, etc. Yet if the city dweller is wearing a jersey of the favourite football team of the community members, a sense of commonality is established. A sense of commonality is essentially all that is needed in order to overcome Us-Them barriers. A common frame of reference is important for facilitating cooperation (Godemann 2008), and reflection of this aspect can lend aid to the TDR process. In acknowledging the relative simplicity of overcoming Us-Them mentalities, you as the reader may be able to reflectively induce a sense of perspective that allows you to see commonality among others in such a way that is conducive to cooperation.

But reflection is not always reflexive. Our biological makeup makes us much more susceptible to reacting before reflecting. There are however a variety of strategies at facilitating the reflection process (Schön 1987; Johns 1999; Scharmer 2016). A learning journal can be an effective method to train oneself in becoming more reflective, for example (Thorpe 2004). The overarching process of reflective practice involves evaluating one’s situation, understanding how it came to be and what it means, and considering how this refreshed understanding may be useful in the future (Rolfe,

Freshwater & Jasper, 2001). This overlaps with the three types of knowledge that TDR addresses: systems knowledge deals with ‘what is’, transformational knowledge deals with ‘what can be understood from ‘what is’’, and target knowledge deals with ‘what can now be achieved with this enlightened understanding’ (Hadorn et al. 2008).

2.3.14 Reflective Dialogue

Yet cultural differences, which may only reveal themselves in interactions and conversation, can still stand in stark opposition such that their priority supersedes the hardwired behaviour of dichotomising individuals, particularly by appearance. As earlier discussed, perceptual differences through the sense of self, values, and language are only some of the factors that may exacerbate the effects of culture clash. But one needs not adopt aspects of another culture in order to understand different perspectives. Merely reflecting on the groundwork for the culture’s beliefs, values, and norms is useful in beginning to break down cognitive and cultural barriers and open up dialogue, an important roll in intercultural cooperation (Conner & Markus 2013). Just as conflict can be understood through culture, this awareness can be used to facilitate cooperation (Ross 1997).

In an effort to explore the role of dialogue in intercultural circumstances, the Dialogue Project at the Center for Organizational Learning at the Massachusetts Institute of Technology investigated the role of reflective practice at United Nations meetings. They found that more often than not, the conversations consisted mostly of 'mere talk,' where individuals spoke with the sole intentions of winning the conversation, or at least not losing it. They found that true dialogue was rare or never even took place (Isaacs 1999; Nehring, Laboy & Catarius 2010).

Dialogue signals reflection with others through language (Nehring, Laboy & Catarius 2010). A trading off of views does constitute as dialogue as there is no reflection occurring. Behavioural psychology naturally plays a role in how we behave in society, as it is in human nature to want to feel accepted or at least not be rejected by our peers (Buss 2015). This highlights a link between culture and reflective practice. Dialogue alone does not necessarily lead to cooperation, but it can allow us to begin to overcome regretful impulses.

Key to reflective dialogue are four components (Nehring, Laboy & Catarius 2010):

> Voice- creating a place for all relevant perspectives and attitudes to be spoken that they may be heard
>
> Listening- attention to the spoken and unspoken nature of the conversation and the 'acoustics' of the space in the room
>
> Respect- acknowledgment of the value of differences and participants' identities
>
> Suspension- willingness to raise and consider assumptions and perceptions without being bound by them

It is important to recognise that these components are active, not passive activities for the participants. This type of discourse is useful in the TDR process as it showcases the

approach's emphasis of treating all bodies of knowledge equally allowing the means for more effective and efficient exchange of knowledge.

Reflective dialogue, however, does not imply that one should simply accept the beliefs, values and norms of others. On the contrary, it encourages the individual to challenge the cultural biases that he or she might carry and cross-examine them with the views of others. It is openness to other views that in central to reflective dialogue; approaching discourse with open ears and an open mind. To mindlessly accept the foundation that grounds the dialogue of peers is to abandon reason all together, evoking the etching of the Spanish artist Francisco Goya titled, "El sueño de razon produce monstruos" or "The sleep of reason produces monsters." While much of life on the planet may not have the ability to reflect, we owe it to the planet and at least to ourselves to use our higher reasoning to challenge our instinctual behaviours, biases, and perspectives of the world.

2.3.15 Reflection: the good, the bad and the potential

Reflection however may be a double-edged sword or sorts. It is clearly capable of broadening perspective, reducing incidences of culture clash, and facilitating cooperation. However, reflection can undermine the formation of cooperative habits. If an individual realises he or she is not self-invested in a cooperative behaviour, or indeed believes that it is too costly to contribute to a cooperative behaviour, the individual may behave selfishly (Rand & Kraft-Todd 2014).

This has important implications for TDR and global endeavours such as the SDGs. Only thirty percent of Americans and a global median of forty percent believe that climate change will harm them personally (Stokes, Wike & Carle 2015). If the majority of the world does not believe that acting to mitigate climate change will serve any benefits to them, it may be extremely difficult to garner the support to elicit large system change. In fact, not only does reflection override any cultural instinct to cooperate, but it could also influence the biological instinct as well. A parent would undoubtedly be more willing to participate in mitigating climate change if they knew its effects would harm their children. But if the parent does not even see climate change as a threat, this response is unlikely.

This seems to tie into the lack of efficient and effective communication between academia and society. Working to address complex-social issues together and through open dialogue may lead to a more transparent exchange of knowledge in both directions that could further amplify progress and begin to fill the knowledge gap. Our ability to share and reflect upon imagined realities empowers us with the potential to unite against abstract concepts like climate change (De Jaegher and Hoyer 2012). This concept of cooperation in the face of adversity could be effective at rallying groups together to combat complex-social issues like poverty, climate change, and inequality if more acknowledge that they are issues that threaten everyone.

2.4 Conclusion

This literature analysis offers a new perspective on some of the social fundamentals of TDR. It has drawn on research in evolutionary biology, anthropology, psychology and reflective practice to better understand cooperation in TDR. It has found that evolutionary biology expresses cooperation through a variety of circumstances, which this paper describes as the 'six rules of cooperation,' largely drawing on Nowak (2006). Yet cultural

instinct, described as habituation, can override the six rules and influence an individual to instinctively cooperate- a process facilitated within some cultures. However, the vastness of culture also facilitates an innumerable number of perspectives of the world, which can present challenges in facilitating intercultural cooperation. These culture clashes may be productively overcome through reflective practice and reflective dialogue. While reflection can undermine habitual cooperation, it allows for cultural and cognitive insight that that can lead to positive outcomes.

Although it may not always been instinctual, reflection can become reflexive if facilitated and nourished through the individual and their culture. However, this is not to imply that one should favour acting before thinking. On the contrary, through reflective practice and engagement in reflective dialogue, one may be able to cautiously overcome culture clashes. In conditioning oneself to reflect before acting, one may be able to enhance their understanding of self, overcome cognitive and cultural biases, and rationally engage in with others in a more constructive manner.

Based on this understanding of cooperation, facilitators of TDR may benefit from acknowledging the critical role that reflective practice holds in the TDR process especially on the African continent whose rapid development over the coming decades will necessitate a strategy that allows its peoples to overcome culture clashes. TDR combined with reflective practice offers a pragmatic approach to strengthen the continent's resilience. Of course, the coming decades will undoubtedly be trying for other parts of globe as well. A future that allows the world to prosper in a sustainable manner requires contributions form more than just academia. Science and society must collaborate to develop a more resilient global innovation system. This necessitates the co-production of knowledge from individuals with different societies, cultures, and generations. TDR will likely hold an instrumental role in the process.

Chapter 3 – SenseMaker® Case Study

3.1 Introduction

Continental Africa is a large focus of the United Nations' SDGs, as it will be the epicentre of much of the world's population growth over the coming decades (UNDP 2016). As large portions of the continent are still riddled with endemic poverty, hunger, and land degradation, it is vital that the continent's growth proceeds in a manner that allows its peoples and land to flourish. Yet the continent harbours a range of rich and diverse cultures, which differ in their beliefs and values. This array of perspectives can present conflict in attempting to cooperatively solve complex social ecological issues like those that the SDGs attempt to address.

While much of the development of TDR has been focused in the developed world, the developing world is a much different context from its European and North American counterparts (Van Breda & Swilling 2016). To address the developing world's complex issues, science and society require an approach that is built in and for a developing world context (Hurni, Wiesmann & Schertenleib 2004; Swilling & Van Breda 2016). TDR offers the potential to address these complex issues, but the literature on TDR is vague on facilitating cooperation across participants (Hollaender, Loibl & Wilts 2002; Walter et al. 2007; Godemann 2008). As the SDGs focus on the developing world and largely Africa, it would seem useful to explore potential TDR methods applicable for the developing world (Walter et al. 2007).

SenseMaker® is a narrative-based research tool that allows for the real-time, continuous capture of data. Drawing on anthropology, complexity science and cognitive neuroscience, the method collects large amounts of micro narratives in order to better understand the culture or community from which the narratives came. Together, these fragmented stories can reveal patterns and themes about the community, which can lead to potential insights and interventions. According to the tools founding company Cognitive Edge, the power of SenseMaker® is that, in contrast to traditional ethnographic research survey methods, the storytellers themselves interpret the patterns and themes revealed in SenseMaker®. While the tool itself is not new, its nature allows it to mould itself within the unique context of its setting. Stakeholders effectively co-create the tool, which then serves as a platform for performing the TDR.

This paper will document the SenseMaker® process as its methods are taught in conjunction to representatives of SDI and the CST in an attempt to reveal its applicability for the developing world. It will attempt to understand the role of cooperation in this TDR method in order to expand the understanding of the role of cooperation in TDR. It will also attempt to reveal the usefulness of SenseMaker® as a TDR method for the developing world. The findings from this research may offer insight as to what kind of TDR methods are needed for the developing world.

3.2 Setting and circumstances

A core component of SenseMaker® is its ability to reveal experience-based data, which reduces the cultural and cognitive bias that is involved in opinion-based data. This makes the unit of analysis not the person, but rather their experience, yielding insight into how people actually experience life. The research is non-parametric- everything is put into one

pot. Because the research is abductive, there is no hypothesis created before the commencement of the research. Rather, a hypothesis may be abducted during the research as the process reveals more insight.

There were two training sessions during the year, which were facilitated by the CST at the Sustainability Institute in Lynedoch, a satellite campus of Stellenbosch University. The first session in January focused on the first two steps of SenseMaker® which includes the co-creation of the tool and the story collection process. The second session held in July focused on the last two steps of the process, which included story analysis and the returning of the stories to the community. Because there were new researchers interested in learning about SenseMaker® during the winter training session, there was a brief review of the first two steps of the SenseMaker® process (tool co-creation and story collection).

A representative from Cognitive Edge facilitated these training sessions with members from SDI, the CST and other researchers within Africa who are interested in the tool. The observations collected for this research draw on the summer and winter training sessions, which largely covers the SenseMaker® process. Observations were made using an observational framework cleared by an ethical clearance committee of Stellenbosch University. Additionally, this researcher partook in some of the SenseMaker® exercises to gain further insight into the tool and its process.

3.2.1 Co-creating the tool

During the summer training session, community members from the Joe Slovo Township outside of Cape Town were invited to the Sustainability Institute in order to participate in the co-creation of the tool. Roughly 30 researchers filled a spacious, light-filled classroom. Four men regarded as community leaders of their township joined the researchers and practitioners at the Sustainability Institute at the start of the week to begin to the co-creation process. Researchers came from backgrounds spanning the humanities and natural sciences.

Narrative research starts from the assumption that one of the best ways to understand a culture or community is to listen more carefully to those affected and to understand how the community views the stories it tells (Zhen 2017a), drawing on a crucial theme of reflective dialogue (Nehring, Laboy & Catarius 2010). In addition to narrative fragments, SenseMaker® depends on signifiers to add meaning and insight to the stories. These incorporate underlying research questions, broad topic areas, and redundancy in order to illuminate weak signals- a seemingly useless piece of information that is actually a part of a significant pattern (Zhen 2017a). The tool includes different components that are co-designed by practitioners, researchers and community members. These components include the initial prompt, which acts as a primer for the rest of the tool. The prompt is followed by questions with interactive interfaces known as signifiers that attempt to add meaning to the tool's assessment. These signifiers include triads, dyads and stones. Finally, a multiple choice section allows for a layer of context through which the responses of the signifiers may be explored.

Prompts
The co-creation of the tool begins with prompting questions that ask the participant to select a picture that best describes an experience they have had in their community. The

training sessions focused on community experience with accessing energy, electricity, light and cooking fuel sources as SDI was interested in successfully integrating clean cookers their partner townships. The prompt is a cornerstone component to the SenseMaker® process. The participant is then asked to share their experience through text or speech, if the survey is completed on a tablet, giving the story a title. They also have the option of taking and uploading a picture with tablet devices. Alternatively, a paper version of the prompt is available for hand-written responses. This process allows individuals to share stories about the related research topic.

Figure 3: Example prompting question. *Source: Zhen 2017a.*

Prompts were developed using the following framework recommended (Zhen 2017a). A sample prompt provided by Cognitive Edge is shown in Figure 3.

- Can it be answered with opinion?
- Does it trigger experiences across the range of the topic? Positive and negative? Rumour as well as direct experience?
- How specific is it? Does it disclose your hypothesis or issue?
- Explicit narratives are backed by motivation, behaviours, perspectives, and feelings.
- The meaning is not in the content. Metaphor, analogy, evolution of language – all get missed by content analysis approaches
- Don't use a picture that people recognise and know because they've been there. These can lead to mundane stories.
- Sometimes you can use photos from a different culture than the one you are within/studying.
- Symbols are very useful. For example, a pile of international currency
- Most people will select an image rather than a narrative story prompt if given the choice. Probably best not to mix images with narrative prompts.
- Try to avoid images within a group that are unified. Mix it up!
- You want ambiguity within an image. What do people read into it?. You still want to use some words to frame the type of experience that is triggered by the image.

- A general rule of thumb: 5 to 6 images are the minimum that you should offer.

To organically elicit the aforementioned type of insight, the design and structure of the questions play an important role. The types of questions that seemed to lead to insightful answers were open ended and non-leading toward any particular subject matter or any particular feeling. The goal was to encourage community members to talk about whatever issues were on their mind. Such questions included:

- A friend of yours is planning to move to Cape Town. What would you tell them about where you live?
- What was your first experience in the settlement like?
- Imagine bumping into an old friend. Tell them one experience about life getting better or worse.

The group experimented with different prompts in order to explore their usefulness for a developing world context. These included acting and dance and had a mixed response regarding their applicability and effectiveness as seen in Photo 1.

Photo 1: One group's experimental acting prompt during summer training session. Source: *Pylipow 2017a.*

Many of the participants from the summer school in January returned for the winter school session, but there were new faces as well. Consequently, the first day included community members who took the paper surveys of the energy assessment and provided some feedback. In contrast to the summer training session, the community leaders of the winter training session made direct contributions by providing feedback about the prompts and formulated questions as seen in Photo 2.

Photo 2: Community leaders discussing their thoughts of the signifiers during winter training session. *Source: Pylipow 2017b.*

Triads

Following the prompts are a number of questions known as signifiers, which give meaning and insight to the stories. Triads are one type of signifier, which allow participants to place a dot within a triangle that allows for a blending of various responses. The proximity of the marker to any particular corner and coinciding theme indicates the level of importance of that theme to the individual's response. The summer training session group was able to begin to develop the triad signifiers using the themes from the stories that emerged from the community leaders. These allow researchers to begin to see patterns in community responses. Triads with data as shown in Figure 5 are only available for viewing through SenseMaker® analysis tools. Those who submit stories only see the triad with no data.

The guiding framework for triad development was as follows (Zhen 2017a):

- Is the triad "Balanced"?
  - Is there one obvious right answer?
    Preferably three neutral answers. Or three positive or three negative
  - Never two negative, one positive
- Are the signifiers (corners) abstract enough?
  - Do they cover concepts and influence?
- Can the signifiers be combined or are they mutually exclusive?
  - If they are mutually exclusive, this is a multiple-choice question
- Does the triad cover the main areas of the question?
  - Are there other important answers that people might want to give that are not covered by these three corners?

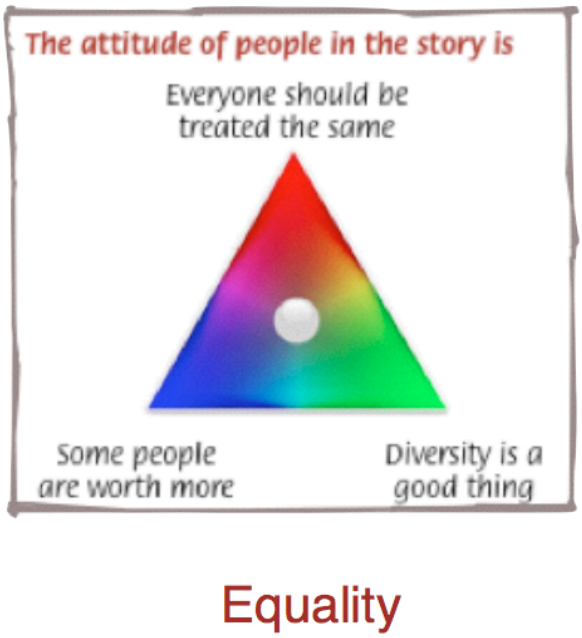

Figure 4: Sample triad testing the theme of equality. *Source: Zhen 2017a.*

Figure 5: Example of a triad with collected responses. *Source: Cognitive Edge 2017.*

Dyads

In contrast to triads, which are useful for exploring theories in the field, dyads test for beliefs and hypotheses (Zhen 2017a). These polarities draw on the concept of Aristotle's Golden Mean, or a desirable middle between two extremes. The following framework was used to develop dyads during the training session (Zhen 2017a).

- Traditional surveys often use a scale running from a negative position to a positive end – the desirable outcome is usually positive and obvious to the participant:
  - "Rate your satisfaction with the meal: Really Bad ←→ Really Good"
  - "How happy are you working here: Unhappy ←→ Happy"
- We prefer to present more subtlety in the question:

- "What triggered the shop theft crime: Economic Need ←→ Pure Greed"
- "How would you describe the decision process: Rigid Bureaucracy ←→ Total Anarchy"

- We do this for two reasons:
  - They "mask" the ideal outcome and deny a simple answer
  - They provide two dimensions for sensemaking

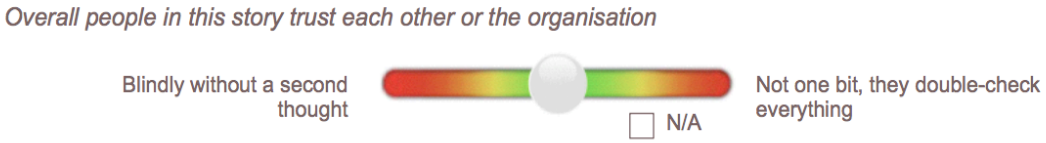

Figure 6: Example of dyad question. *Source: Zhen 2017a.*

Stones

This signifier was originally created as a visual form of indexing that could be used in and by the aid and community development sector, mostly in illiterate communities in Africa (Zhen 2017a). Stones are used for evaluation. The stones canvas can be a square or rectangle. The rectangle can be long like a process or mural. Stones are essentially a large dot that mark some place on the canvas that allow for the dropping of multiple data points on a single bias (Cognitive Edge Pte Ltd. 2018). Respondents are limited to the options offered with 5 or 6 stones per canvas. A stone can only be placed in one area. This is the most important or first choice location (Zhen 2017a). The stones interface seen in Figure 7 may be testing against the bias of colonialism, racism or struggle. It invites the respondent to place a stone or stones linked with emotions on the canvas. The particular location on the stone on the canvas relative to other sites yields specific data.

Figure 7: Example of Stones interface. *Source: Cognitive Edge Pte Ltd. 2018.*

Multiple Choice Questions

Multiple-choice questions are the secondary unit of analysis within SenseMaker®. The questions attempt to filter and assess the relative strength of relationships between the

facilitators through the stories shared by participants, reflected in patterns (Zhen 2017a). Multiple-choice questions in the SenseMaker® process allow researchers to slice the data to look at patterns within patterns. These include information about age, gender and other specifics regarding the research topic. Guidelines for developing multiple-choice questions included (Zhen 2017a):

- Characteristics
    - Can be about the story or about the participant
    - They have a defined answer set
    - They can be single or multi answers
    - "Other", "I don't know" and "I'm not telling" are valid answers!

3.2.2 Story Collection

The second phase of SenseMaker® involves the actual collection of stories and data with the newly created tool. During the summer training session, the prompts and signifiers developed by the researchers were sent to Cognitive Edge to be formatted into a program suitable for a tablet or other touch-screen device.

The story collection process during the summer training session took place in the Joe Slovo Township outside Cape Town. The pace during the mid-summer afternoon was slow, with most taking refuge from the sun in the shade of shacks. The researchers formed groups with community leaders who facilitated interactions with community members. Over the course of the afternoon, research groups collected stories from community members using electronic tablets loaded with the SenseMaker® software.

Researchers used the following guidelines during the story collection process (Zhen 2017b).

- There is no right answer
- The only wrong answer is the one that is given to the storyteller
    - If they understand the corners, then their answer is always right (which may differ from how you see it)
- The more people there are, the less useful the story will be
    - People will be reluctant to share difficult stories in front of other people
- The best collectors are the quietest and the quickest
- The triads are only about the situation in the story
- Their story, their words, their marks on the triangles

Photo 3: Community member recording a story on a tablet device in her home. *Source: Pylipow 2017c.*

Photo 4: Pylipow explaining the story collection interface to community member. *Source: Pylipow 2017d.*

SDI intended to create a short video with community leaders in an attempt to indigenise the collection process, where a community leader would demonstrate how the story

collection process would work. However, their story collection dates fell outside of the research dates for this paper.

3.2.3 Story Analysis

The Story Analysis portion of the process allows the researchers to begin to gather insight into the lives of community members without explicitly drawing conclusions. This was done once during the summer training session using the stories collected during the session, and then again in the winter school using stories that had been collected in Accra through SDI.

SDI members from Cape Town and Accra were in the process of collecting stories during the winter training session, so the data sample grew from about two hundred stories at the beginning of the week, to roughly one thousand by the end of the week. This stage stresses the importance of design over analysis in complexity research as the situation can change immediately after data collection.

During the training session, the researchers formed groups and each chose a triad to analyse. Each data point, in this case on a triad, represents a unique story, which can be accessed by the analyst, lending context to the data. The groups were able to view real-time data from SDI's story collection through the SenseMaker® Suite, an online application. It allows the researcher to view the responses from the stones, triads and dyads and filter for demographics including age and gender, as well as multiple-choice questions. However, researchers were also given access to a desktop program that offers additional tools from the suite to analyse the data.

Important to the analysis portion of SenseMaker® is to explore the data, but not to interpret it as this would introduce researcher bias and defeat the purpose of the tool. One method used to achieve this was through analysing themes of the narratives provided. Theme analysis involved recording the theme of each story that was collected during the story collection process followed by sorting and grouping them into overarching themes. The analysis portion of the process allows researcher to look for interesting patterns in the data as seen in Photo 5. Researchers filter through all the data and demographics and present the patterns to community members who then interpret the patterns. This is the one step during the process where community members are not directly involved.

Photo 5: Theme analysis: during (above) and after (below). *Source: Pylipow 2017e.*

3.2.4 Returning the stories

After the data analysis, community leaders were invited back to the Sustainability Institute near the end of the week. Each research group presented their findings to the community members for interpretation. The discussion was kept informal allowing community leaders to openly discuss their interpretations with each other and the

researchers. This is a crucial step of SenseMaker® in that it removes the potential of researcher bias in interpreting the findings. Researchers explained the reason why they chose to analyse the triads/dyads etc. through their particular filters and indicated why they thought the pattern they found was interesting.

Photo 6: Community leaders in centre of classroom. *Source: Pylipow 2017f.*

3.3 Analysis

3.3.1 Perceiving opportunity

In the tool development stage of the training session, some community members took the figurative podium to discuss poor sanitation in their community, citing the dangers of travelling alone at night to the nearest outhouse. These monologues went uninterrupted as to reduce researcher influence. Poor housing conditions, lack of sanitation, and safety are all issues that are naturally and understandably pressing. Although concerning, researchers exploring community life are often already aware of the content of these types of answers. According to the SenseMaker® process, the aim of the discussion is to reveal systemic issues in the communities that may have been unknown to not only researchers but to community members as well (Zhen 2017a). While acknowledgement of these issues may continue to facilitate discussion, it undermines the tool's effectiveness.

Throughout the process, it was revealed that community members, who may have been used to working with outside groups/organisations that intend to improve community living conditions, may give responses that explicitly highlight the problems that community members want to see changed. In other words, they may colour their responses to match the organisation's prerogative, believing that researchers will understand their own perspective, which could work in their favour (Varela, Thompson & Rosch 1999). While the intentions are understandable, agenda-lead answers undermine the process by inhibiting the tool from revealing underlying trends within the community (Zhen 2017a). Participants may be cooperating, but this does not necessarily imply that there is progress.

Perception plays a significant role in the types of discussions that arise during the tool development phase. This is especially relevant to the introduction of personal bias on the part of the community leaders. Cooperative behaviour at its foundation is based on a perception of a cost-benefit situation (Nowak 2006). Cost-benefit scenarios in cooperative situations necessitate a certain level of personal bias in the decision making process (Rand & Kraft-Todd 2014). When an individual perceives a cost-benefit scenario, it would not be surprising to attempt manipulate the situation in their favour. This is why SenseMaker® attempts to avoid opinion-based material (Zhen 2017a).

On this point, by limiting the opportunities for opinion-based input, the tool reduces the opportunities for culture clashes to arise. Stemming from conflicting norms and values, cultural differences in perception may go un-noticed as they have very little opportunity to arise (Conner & Markus 2013). During the training session, many of the researchers came from very different backgrounds compared to community members, presumably harbouring very different cultural backgrounds as well. As SenseMaker® enables researchers as largely facilitators of the process, they have little chance of explicitly expressing opinions influenced by cultural biases to community members. The centre of focus is placed on the community members.

3.3.2 Language in influencing perception

However, the process was not left vulnerable to the mercy of the varying perceptions of participants. SenseMaker® attempts to use conscientiously crafted language to guide perceptions in a constructive direction. As language is closely tied with culture, the sense of self, and general perception (Deutscher 2011), it may consequently serve as a useful medium for navigating the cultural seas in TDR.

As SenseMaker® produces more useful findings with the restriction of the introduction of bias, one technique it uses to reduce the perception of opportunity, which could elicit bias, is language choice. To achieve this, it is important that community members do not feel like they are sharing explicitly with the researcher, but rather that they are simply openly sharing (Zhen 2017b). Researchers are often associated with having the ability to influence outcomes, which could encourage the participant to view the researcher as an agent of change, and consequently provide stories that reflect the needs and desires of the individual and their community.

The researcher may be able to reduce their influence on the community member by embodying the character of a scribe, rather than an interviewer or even researcher (Zhen 2017b). The connotation prescribed to a scribe is one who simply collects data, someone who does not have power to influence change in contrast to a researcher. The work is the same, but the connotation associated with each of these words among community members is important to recognise. This may reduce the chance that the respondent gives an agenda-lead answer in the presence of a researcher and instead, is lead by the tool to develop a more organic answer.

It is important to note, however, that the difference in connotation and definition between ‘scribe’ and ‘researcher’ may not carry over to non-native English speakers. Cultural perceptions can shape language, and language can shape perception (Deutscher 2011). Just as the subtle differences between and among colours are interpreted by culture,

subtle differences in connotation between similar concepts may not carry over to other cultures and languages. The difference between a scribe and researcher to a native Xhosa speaker, for example, may not be as intuitive as it may be for a native English speaker On this same idea, SenseMaker® allows stories to be explained in the native language of the storyteller. Consequently, there can be a loss of knowledge through the translation process for the story analysis (Ross et al. 2002). These are crucial topics to consider in TDR that involves multi-lingual groups.

3.3.3 Storytelling

Traditional cooperative mechanisms, like the six rules of cooperation, imply that cooperative scenarios present a cost-benefit opportunity (Nowak 2006; Rand & Kraft-Todd 2014). There may be a cost to not cooperating, which incentivises one to cooperate, or an inherent benefit for cooperating from the start. This perception, however, provides the individual with the opportunity to reflect upon and manipulate their situation for their benefit (Nehring, Laboy & Catarius 2010; Rand & Kraft-Todd 2014).

This opportunity, however, may not be as readily recognised when an individual is not provoked to view a situation through a traditional cost-benefit viewpoint. SenseMaker® attempts to diminish perceptions of opportunity through experience based fragments. This technique was promoted during the co-creation of the SenseMaker® interface with community leaders to develop prompting questions for the story collection process.

Questions that prompt for experience rather than an opinion peel away the self-interest of the individual (Rand & Kraft-Todd 2014; Zhen 2017a). Storytelling has little to do with cooperation, as story telling does not necessarily require cooperation to take place. SenseMaker® seems to exploit this fact allowing it to facilitate cooperation simply by altering perception. It alters perception to influence individuals to not view the prompt as cost/benefit opportunity. That is, they have nothing to gain or lose by sharing a story. There is no investment on the individual's part, and they don't have to make a sacrifice (Roberts 2008).

Two major benefits seem to come out of narrative based TDR that elicits experience over opinion. Responses are more organic and more indicative of the real world rather than individual perception. An important part of the prompting questions to begin to co-create the tool with the community members is to avoid prompts that are opinion based, and instead prompt for experience. This emphasises that perspectives do not always reflect realities and real world choices (Harari 2014). In prompting for experience instead of opinion, this step of the process relinquishes to some extent the influence of cultural and cognitive bias, which could otherwise interfere with the progress of the research. Along with the exchange of knowledge, network building is a crucial component to TDR (Walter 2007).

3.3.4 Creating a sense of Us

The nature of this project and of TDR in general brings people together of often vastly different backgrounds to collaboratively solve complex issues (Hollaender, Loibl & Wilts 2002). In fact, an important aspect of TDR is that of group unity (Godemann 2008). Of course, different cultural backgrounds often harbour different values and belief system that can sometimes be conflicting (Conner & Markus 2013). Cognitive biases can also

affect cooperative research, as they can be engrained in our perceptions of the world from infancy (Kelly et al. 2005). A simple example pertinent to this project presents itself through the language of the community members involved in the research.

The Bantu language term 'Mzungu' refers to those of European ancestry. Originally used to refer to explorers in the African Great Lakes region in the 18th century, it now is a common term that Bantu people use throughout much of southern hemisphere Africa. While it is not necessarily a derogatory term, it carries a connotation with it that enforces an Us-Them mentality (Deutscher 2011; Sapolsky 2017). This of course can be problematic for cooperative research efforts. While perceptive biases are in no way limited to community members, their view of outsiders and particularly researchers is especially pertinent to this project and to other TDR projects in the developing world.

But perceptive biases that encourage Us-Them thinking can be overcome through acknowledging commonality (Sapolsky 2017). Community leaders who served as facilitators in the story collection process seemed to serve beneficial for opening up dialogue with those who may have otherwise been introverted. As an integrated individual of the community in which the data is collected, researchers may have an easier time collecting useful data.

However, the setting throughout the research seemed to hold a role in influencing Us-Them perceptions. During the discussion of the findings with community leaders at the end of the winter session, four community leaders sat in the middle of the classroom presented with a screen at the front of the room, and were surrounded by many unfamiliar faces. When invited to come forward to view the data on the board, the group seemed to discard the offer until the oldest of the community leaders began to approach the broad. It was later revealed that some community members had trepidation about classroom settings due to negative experiences with school. Isolating the community members in a potentially uncomfortable setting surrounded by a number of unfamiliar faces likely enticed the leaders to view a larger Us-Them disparity (Sapolsky 2017). Although the leaders eventually provided valuable insight, this particular setting may have not been conducive to creating a sense of Us.

3.3.5 Reflection

Creating a sense of Us is crucial to creating a shared sense of perspective and to facilitating cooperation (Sapolsky 2017). While this can be achieved passively through perceptive biases, this assumes that the biases will work in favour of the shared sense of self. As TDR rarely if ever deals with a single, cultural group (Godemann 2008), perceptive biases may work against the shared sense of self. Consequently, it can be useful and necessary to actively create a shared a sense of Us.

Reflection can be a powerful tool that allows one to wilfully shift perception to attain greater insight or to work toward a fruitful outcome (Nehring, Laboy & Catarius 2010; Scharmer 2016). Especially pertinent to TDR, reflection can help one overcome perceptive biases that may otherwise inhibit cooperation (Conner & Markus 2013). The SenseMaker® method coaxes individuals into a reflective state as it is them who give meaning to their own experience, rather than it being interpreted by researchers/experts. The tool forces respondents to reflect on their lived experiences, and it shares these reflections with researchers offering insight.

This is particularly the case during the story collection process as well as the interpretation of the analyses during the last stage of the process. During story collection, the questions that follow the respondent's story (triads, dyads, stones, and multiple choice) allow the individual to shape their own perception of their experience by adding layers of meaning. Community members attempt to interpret the patterns and the data that is presented to them as they reflect on their lived experiences in the community.

When researchers view this data and the patterns that emerge during the story analysis portion of the process, they attain a glimpse of the reflective processes and perceptions of community members. This is reminiscent of reflective dialogue, which signals reflection with others (Nehring, Laboy & Catarius 2010). In a sense, reflective dialogue is facilitated through the medium that is SenseMaker®.

The story returning portion of the process also allow researchers to enter a reflective state, as the patterns from the analysis and the interpretations by community members challenge or confirm underlying suspicions they may have had. As researchers in the room listen, they may reflect on their experiences in investigating the data. Through this reflective process, perceptions and understandings of the situation may shift. The reflective nature of this process can help participants create a sense of Us, especially when they relate the findings to themselves- an important step to facilitating cooperation (Godemann 2008; Harari 2014; Sapolsky 2017).

3.3.6 Field and technical hiccups

Although this document focuses on exploring the role the cooperation in TDR, and specifically in the SenseMaker® method, it also is attempting to evaluate the applicability of SenseMaker® for a developing world context. Consequently, the documentation of the complications must be reported as well.

There seemed to be an occasional incompatibility between the technology used for the data collection and the culture of community members. Researchers used tablet devices for the story collection process. Some participants had the occasional difficulty in using a touch screen device. Even more problematic was participants during the collection process had a difficult time comprehending the tools on the program. After realising this issue, one researcher speculated the difficulties her community of focus in Uganda would have in interacting with a touch screen device. She anticipated the community members would view the technology as that belonging to the 'elite,' a group toward whom the community feels resentment, which could sway them from participating undermining any sense of unity that is so crucial for the TDR process.

SenseMaker® is able to overcome this technology-culture gap by facilitating the story collection process with paper and pencil. Although paper was not used for the story collection component of the training session, a number of community members had trouble with reading the prompts and questions. This can pose an issue for TDR in general on the African continent, where the majority of African countries have literacy rates well below the global average (The World Bank 2017).

Even with a gatekeeper present, some found it difficult to find community members willing to share their experience in the communities. Their reasons were not ubiquitous or

clear, but it was inferred that many were disgruntled with past experiences in collaborating with outsiders who had similar intentions of community beneficiation.

Similarly, at one point, a community leader began to follow the group seemingly out of interest. Researchers deduced that his presence would possibly act as an effective gatekeeper. However, it was later revealed that some community members were afraid of speaking poorly about the conditions in the township for fear of retribution from the community leader. While the leader seemed to have genuine interest in aiding the story collection process, the leader's presence affected the perception of fellow community members, which inhibits the overall process. This situation is why SenseMaker® promotes the collection of stories in the absence of others (Zhen 2017b).

A collective, group perception plays a very important role in the SenseMaker® process. There seemed to be a failure of fusion between researchers and community leaders during the process. Of course, relationships can be slow to build, but setting and activities can help facilitate the process. Community leaders may have felt out of place in the centre of a classroom surrounded by a group of unfamiliar faces, which would not be conducive to group cohesion. Likewise, researchers had little personal interaction time with the community members. Therefore it may be beneficial to keep meetings with community members more casual, comfortable, and informal. This could be achieved through social activities before research discussion or even holding meetings within the community.

3.4 Conclusion

In TDR, researchers and stakeholders must exchange and acknowledge each other's values and beliefs in order to pursue their collective goals. They must develop a set of orientations on possible future scenarios and promote transitions towards a jointly defined goal (Walter et al. 2007). The methodology can be a robust and dynamic type of science that may allow some of the most vulnerable areas of the planet to tackle their ever-shifting social-ecological issues. As it brings people of often vastly different cultural background together, understanding its techniques for facilitating cooperation may be extremely beneficial for addressing global challenges over the coming decades.

SenseMaker® shows potential in being able to help the developing world address some of its complex issues for its ability to reduce biased input throughout the process and limit the opportunities for culture clashes. It does this through using carefully crafted language to elicit stories based on experience rather than those peppered with opinion. It also does this by forcing individuals into a reflective state to allow them to give meaning to their stories and the patterns that emerge. SenseMaker® also facilitates cooperation by reducing the opportunity to recognise culture clash. As perceptive clashes can significantly inhibit cooperation, this approach seems to be beneficial for a cooperative TDR method.

These findings shed light on the some of the requirements and challenges for conducting TDR in a developing world context. The African continent's vulnerability to global shifts will likely put it at the centre of the world's attention over the coming decades. Layered with innumerable cultures across its countries, it will be all the more important that society is prepared with strategies, tool and knowledge to address these issues. TDR is a promising methodology for creating transformation and SenseMaker® may be a very useful tool in the TDR toolbox.

Chapter 4 – Conclusion Summary

4.1 Overall findings of the study

This paper has aimed to explore some of the social and cognitive aspects rooted at the core of the TDR process including cooperation, culture and reflection. It has attempted to answer three questions relevant to this exploration:

1. How might cooperation be facilitated in the TDR process?

   Reflection in the TDR process offers stakeholders the opportunity to understand differences in values, beliefs and goals among stakeholders. TDR methods that incorporate a reflective component may be more successful at facilitating cooperation than those that do not. Participants reflect on their own experiences and consider the experiences of others throughout TDR processes. This model proposes how and why the reflective component of TDR is crucial to creating positive change that is substantial and lasting- a critical need for sustainable development. It may be useful in evaluating the potential of new TDR methods, especially those created for a developing world context. This could expedite the rate at which TDR methods are developed and used.

   Nearly anyone is capable of engaging in reflective practice. It is an amazingly powerful activity that can significantly improve the disposition of not only the individual, but also those with whom the individual interacts through an enlightened understanding of self. The most challenging issue regarding reflective practice is making it reflexive. Arguably, a lack of enough reflection in the every day lives of individuals inhibits their ability to grow and progress in a positive direction. Our cognitive and cultural biases entice us to accept their nature as true. TDR may help facilitate reflective practice and allow for the benefits that follow from it.

   However, reflection is not the only way to alter perception in favour for cooperation. While reflection often plays a significant role in TDR, perception can still be shifted through the use of language. A key example is the perceived power dimensions between scribe and researcher in the SenseMaker. In other words, perception in TDR can be shifted passively and actively, internally and externally. This awareness can be useful in contemplating methods for facilitating cooperation.

2. Is SenseMaker® able to facilitate cooperation and if so, how?

   SenseMaker® seems to indeed facilitate cooperation, but not through a traditional understanding of the mechanisms of cooperation. Through emphasising story telling over opinion-based input, the tool appears to bypass the classical cost-benefit approach of cooperative behaviour. In doing so, there is a reduction in personal bias leaving data that may be more valuable for this type of research. It appears that a storytelling approach that elicits experience-based rather than opinion-based data shifts one's perception such that personal biases have a lesser impact.

   SenseMaker® also has the potential to garner a strong sense of unity among researchers and practitioners, a necessary component of eliciting cooperative behaviour. The process acts as a medium for facilitating reflective dialogue, which

allows participants to gather insight into their peers and better understand their motivations, beliefs, and values. The shared reality that SenseMaker® creates, may also allow it begin to bridge culture gaps between disciplines. However, sincere thought and effort is needed in order to create a sense of Us.

These findings have also made it necessary to distinguish the difference between cooperation in TDR and progress in TDR, because they are not necessarily synonymous. While cooperation is often associated with positive outcomes, its traditional understanding allows for the introduction of bias by a party in order to make favourable outcomes, as opportunities for cooperation present a cost-benefit scenario. While the parties involved may cooperate superficially, there may be little underlying progress. Nevertheless, cooperation is a necessary component of progress in TDR, so its understanding and facilitation are just as important.

3. Is SenseMaker® useful for a developing world context?

The core of this question attempts to understand whether or not progress and transformation occur as a result of the use of SenseMaker®. In order to answer this question, there must be further analysis of what happens after returning the stories. This timeframe of this study was unfortunately not long enough to explore the outcomes of the research conducted by SDI.

If there were more TDR methods for a developing world context, this question could potentially be addressed through cross-referencing the characteristics of those to SenseMaker®. However, as there is not an abundance of evidence of TDR methods successfully used in a developing world context, it is difficult to attempt to describe the ideal characteristics of such a method. Yet as the methodology's prevalence grows, it may become easier to highlight the components of methods that seem to work well.

Storytelling seems to be a tradition that is deeply rooted across all cultures of the world. They often embody a society's beliefs, values, morals, history, challenges, and emotions as they move across time and space. Stories can consequently yield insight into culture especially from an outside perspective. As a continent that harbours many cultures that emphasise the tradition of storytelling, Africa may be well-suited for the SenseMaker® approach as a TDR method. The experience-based story collection component of SenseMaker® may be an indication of the types of components that are suitable for a developing world context.

4.2 Critique of the study and its contributions

Although this study originally intended to follow the rollout of SenseMaker® by the SDI across their South African, Ugandan, and Ghanaian divisions, issues with timing prevented the rollout from taking place as early as anticipated. Consequently, further documentation of the use of SenseMaker® in a developing world context may offer deeper insight into the tool's strengths, weaknesses, and applicability for the African continent.

As TDR focuses on stimulating a change in thinking and behaviour that may eventually manifest as societal transformation, a significant amount of time is needed to track these

changes. More insight could have been developed if the study had been able to not only follow the SDI throughout their use of the tool, but also track the developments over the following months and years. The role of reflection may hold more dynamic influence after the SenseMaker® method as been implemented.

4.3 Recommendations for further research

A change in thinking and behaviour that leads to societal transformation would seem to require empowerment and sustained motivation. This is a vital component of TDR, yet there does not seem to be a sufficient amount of research on stimulating empowerment within TDR especially in the developing world. Cooperation undoubtedly is needed throughout the TDR process, but cooperation alone does not lead to transformation.

Storytelling shows promise as a component of TDR methods. It seems to be an integral part of development as a species and acts as a cultural record that contains layers of complex information. Exploiting our interest and inclination toward storytelling for TDR especially in the developing world may be a useful in better understanding the challenges that communities (particularly vulnerable ones) are facing on the African continent in light of the swift climactic and economic changes occurring around the world.

Human behaviour has arguably been the largest contributor to many of the challenges that the United Nation's SDGs attempt to address. It could be beneficial to explore the connections between our cognitive predispositions and attitudes toward our lived experiences. Doing so may begin to offer insight as to how we might be able to exploit our understanding of ourselves for the betterment of the planet and those that inhabit it.

4.4 Final Thoughts

The explorations of this paper are applicable to any facet of life where humans must interact to solve complex issues. From work to domestic life to serious global issues- utilising knowledge of cooperation, culture, and reflection may empower the individual with clarity of insight about themselves, their peers, and their environment to act in a more compassionate and rational manner.

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